Series 1949, No. 7 Issued December 1958

Fulton County Georgia

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with the
UNIVERSITY OF GEORGIA, COLLEGE OF AGRICULTURE

How to Use THE SOIL SURVEY REPORT

THIS SURVEY of Fulton County will help you plan the kind of farming that will protect your soils and provide good yields. It describes the soils, shows their location on a map, and tells what they will do under different kinds of management.

Find Your Farm on the Map

In using this survey, start with the soil map, which consists of the 48 sheets bound in the back of this report. These sheets, if laid together, make a large photographic map of the county as it looks from an airplane. You can see woods, fields, roads, rivers, and many other landmarks on this map.

To find your farm on the large map, use the index to map sheets. This is a small map of the county on which numbered rectangles have been drawn to show where each sheet of the large map is located.

When you find the map sheet for your farm, you will notice that boundaries of the soils have been outlined, and that there is a symbol for each kind of soil. All areas marked with the same symbol are the same kind of soil, wherever they appear on the map.

Suppose you find an area on your farm marked with the symbol Ab. To learn the name of the soil that this symbol represents, look at the map legend. The symbol Ab identifies Altavista fine sandy loam, undulating phase.

Learn About the Soil on Your Farm

Altavista fine sandy loam, undulating phase, and all the other soils mapped are described in the section, Soil Series, Types, and Phases. Soil scientists described and mapped the soils as they walked over the fields and through the woodlands; dug holes and examined surface soils and subsoils; measured slopes with a hand level; noted differences in growth of crops, weeds, brush, or trees; and, in fact, recorded all the things about the soils that they believed might affect their suitability for farming.

After they had mapped and studied the soils, the scientists judged what use and management each soil should have and then placed it in a management group. A management group is a group of similar soils that need and respond to about the same kind of management.

Altavista fine sandy loam, undulating phase, is in management group A–3. Turn to the section, Management Groups, and read what is said about the soils of group A–3. You will want to study the table which tells you how much you can expect to harvest from Altavista fine sandy loam, undulating phase, under two levels of management. In columns A are yields to be expected under ordinary management, and in columns B are yields to be expected under improved management. Additional information about suitability of the soils for use is given in the section, Land-Capability Classification.

Make a Farm Plan

Compare the yields and farm practices on the soils of your farm with those given in this report. Look at your fields for signs of runoff and erosion. Then decide whether or not you need to change your methods. The choice, of course, must be yours. This survey will help you plan new methods, but it is not a plan of management for your farm or any other farm in the county.

If you find that you need help in farm planning, consult your local representative of the Soil Conservation Service or your county agricultural agent. Members of your State agricultural experiment station and others familiar with farming in your county will also be glad to help you.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Contents

Walker, J. H

Soil survey, Fulton County, Georgia [by J. H. Walker and others. Correlation by A. H. Hasty. Washington, U. S. Govt. Print. Off., 1958.

79 p. illus., maps (part fold. col.) 29 cm. (U. S. Soil Conservation Service. Soil survey, ser. 1949, no. 7)

Cover title.
Report rev. by R. C. Jurney.
In cooperation with the University of Georgia, College of Agriculture.
"Literature cited": p. 65.

1. Soil-surveys—Georgia—Fulton Co. (Series)

[S591.A22 1949, no. 7] 631.47 Agr. 58–304

U. S. Dept. of Agr. Libr. for Library of Congress 1So32F 1949, no. 7

SOIL SURVEY OF FULTON COUNTY, GEORGIA[1]

By J. H. WALKER, in Charge, University of Georgia, College of Agriculture, J. T. MILLER, T. W. GREEN, and R. F. WELLS, Soil Survey,[2] United States Department of Agriculture

Correlation by A. H. HASTY, Soil Survey

United States Department of Agriculture, Soil Conservation Service, in Cooperation with the University of Georgia, College of Agriculture

General Character of the Area

FULTON COUNTY is entirely within the Atlanta Plateau. It is made up principally of rolling to hilly and broad smooth uplands, although some level flood plains occur along the Chattahoochee River and many of its tributaries. Corn, oats, wheat, and hay are important crops. Cotton is the principal cash crop. Vegetables are grown for home use and for market.

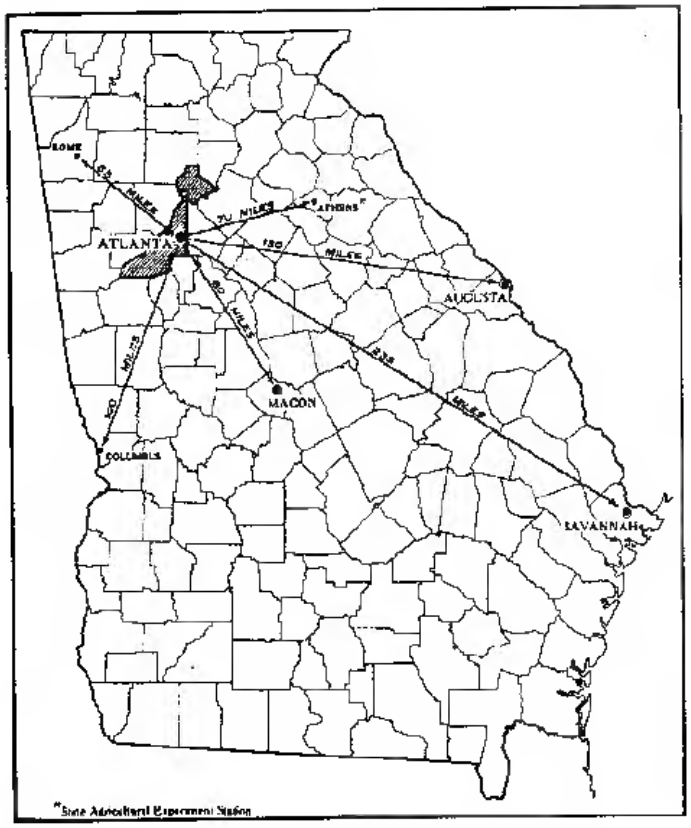


Figure 1.—Location of Fulton County in Georgia.

Dairy cattle, poultry, and some beef cattle and hogs are raised. The county has many industries, mainly in Atlanta and its suburbs.

Location and Extent

Fulton County is in the north-central part of Georgia (fig. 1). Its area is 523 square miles or 334,720 acres. The outline of the county is irregular; the longest dimension is northeast-southwest. Atlanta, the State capital and county seat, is approximately in the center of the county. Distances from Atlanta to well-known places in Georgia are shown in figure 1.

Physiography, Relief, and Drainage

Fulton County lies wholly within the Atlanta Plateau (*8*)[3], which is a part of the Piedmont province (*5*). This province is a major physiographic division of the United States and extends from southern New York to central Alabama. The Atlanta Plateau has a rolling surface characterized by moderate slopes but has no great relief. One of its most striking features is the valley of the Chattahoochee River, ranging from 150 to 400 feet in depth and from 2 to 5 miles in width from rim to rim.

The general surface features of the county are characterized by rolling to hilly and broad smooth uplands. The largest areas of smooth land are in the northern part of the county near Roswell and Alpharetta and on the drainage divide extending southwest from Atlanta to Palmetto. The areas most dissected border the Chattahoochee and Little Rivers and some of their larger tributaries. These areas have steep V-shaped valleys and sharp ridgetops, and their slopes range generally from 20 to 40 percent. The rolling land has low ridges and rounded knobs with deposits of colluvial-alluvial material in depressions and along drainageways.

Level or nearly level flood plains occur along the Chattahoochee River and many of its tributaries. The flood plain is a few yards to nearly half a mile wide along this river and is largest in the northern part near where the river enters the county. Remnants of stream terraces lie above the flood plain at two or possibly more levels. In many places the alluvial deposits making up these terraces are thin and considerably dissected by drainageways.

Where the Chattahoochee River enters the county, the elevation is approximately 900 feet and where it leaves it, about 75 miles to the southwest, the elevation is approximately 700 feet. The stream course is nearly southwesterly and approximately parallel to the trend of the geologic structure (*8*). In the southern part of the county the ridgetops lie at elevations ranging from 1,000 to 1,050 feet. North of Atlanta the higher elevations range from 1,100 to more than 1,200 feet at

[1] This report was revised by R. C. JURNEY, Soil Survey, United States Department of Agriculture.

[2] Fieldwork for this survey was done while Soil Survey was a part of the Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. Soil Survey was transferred to the Soil Conservation Service on November 15, 1952.

[3] Italic numbers in parentheses refer to Literature Cited, p. 65.

a point about 5 miles west of Alpharetta. Elevations at several places in the county are as follows: Alpharetta, 1,130 feet; Roswell, 1,072; College Park, 1,057; Atlanta, 1,050; Fairburn, 1,041; Stonewall, 1,024; and Ben Hill, 962.

The drainage system of the county is characterized by a dendritic drainage pattern. The pattern is well developed throughout the uplands, and surface drainage nearly everywhere is good to excessive. For much of Fulton County, drainage is into the Gulf of Mexico by way of the Chattahoochee and Little Rivers and tributaries of the Flint River. About 35 square miles, including the southern part of Atlanta and the adjacent area to the south, is drained eastward into the Atlantic Ocean by tributaries of the South River.

Most of the first bottoms of the Chattahoochee River are well drained, yet they are subject to overflow several times during the year. In many places along other streams, however, sediments recently washed from the surrounding uplands have filled the channels and altered drainage. As a result, many areas along small streams are swampy or semiswampy much of the year. In most places this altered drainage has not had sufficient time to change the characteristics of the soil profile, but some areas are too wet for cultivated crops.

Climate

The climate of Fulton County is humid and continental. The winters are mild, but they have very changeable temperature. The prevailing wind during winter is northerly. The weather is largely controlled by movement of areas of high and low barometric pressure and the accompanying winds. In winter these conditions cause frequent alternation of warm moist southerly winds and cold dry northerly winds (*7*). Data on normal monthly, seasonal, and annual temperature and precipitation at Atlanta are given in table 1.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Atlanta, Fulton County, Ga.*

[Elevation, 977 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1954)	Wettest year (1948)	Average snowfall
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December	45.2	73	1	4.55	3.00	4.11	0.5
January	44.6	76	−2	4.67	3.73	3.47	1.0
February	46.7	78	−8	4.82	2.70	6.20	.9
Winter	45.5	78	−8	14.04	9.43	13.78	2.4
March	52.7	87	8	5.67	3.07	10.19	.2
April	61.7	93	25	4.42	1.91	2.82	.1
May	70.0	97	38	3.82	3.31	7.83	0
Spring	61.5	97	8	13.91	8.29	20.84	.3
June	77.7	100	39	4.02	2.08	1.32	0
July	79.5	103	53	4.41	6.31	11.26	0
August	78.6	100	55	3.81	1.14	4.20	0
Summer	78.6	103	39	12.24	9.53	16.78	0
September	74.4	102	43	2.96	.26	3.60	0
October	63.4	94	28	2.60	.17	.73	(3)
November	51.9	82	14	3.41	4.12	15.72	.1
Fall	63.2	102	14	8.97	4.55	20.05	.1
Year	62.2	103	−8	49.16	31.80	71.45	2.8

[1] Average temperature based on 21-year record, through 1955; highest and lowest temperatures on a 52-year record, 1879-1930.

[2] Average precipitation based on a 21-year record, through 1955; wettest and driest years based on a 90-year record, 1859-1955; snowfall, based on a 41-year record through 1930.

[3] Trace.

The average winter temperature is 45.5° F. The temperature usually rises rapidly in March and April. The difference between the midwinter (January) average and that of midsummer (July) is 34.9°, which is relatively small compared with a difference of 60° in some of the more northern States. The summers are warm but are comparatively free from oppressive heat, because of the altitude and latitude of the county. The average summer temperature is 78.6°.

The average date of the last killing frost in spring is March 29, and that of the first in fall, November 8. The growing season therefore averages 224 days and is sufficient for the production of all the crops commonly grown. Fruit tree blossoms, especially peach blossoms, are occasionally damaged by late frost.

The winters are mild enough for the growing of fall-sown oats, wheat, rye, clover, and other crops for cover and grazing. Turnips, cabbage, kale, radishes, onions, rape, peas, and spinach can be planted late in fall or in December. Potatoes, beets, carrots, collards, and mustard can be planted in January and February, and other vegetables, during the latter part of March and the first part of April. Small grains and clover, if sown late on poorly drained soils, are damaged by the heaving produced by alternate freezing and thawing. Damage to these crops rarely occurs on the better drained sandy soils.

The length of the grazing period depends on the kinds of pasture plants sown and on the amount of fertilizer used. The grazing period for pasture consisting of bermudagrass, broomsedge, crabgrass, common lespedeza, and weeds extends from the latter part of March to the latter part of October. This period can be lengthened by use of proper fertilizers and by seeding with clovers, coastal bermudagrass, tall fescue, orchardgrass, and ryegrass. Permanent pasture should be supplemented with temporary pasture during dry spells and winter.

Rainfall varies somewhat from year to year, but its seasonal distribution is generally favorable for crops. Serious drought is not likely to occur more than once in 10 to 15 years. Wet weather sometimes damages hay during the curing process and small grain at harvesttime. During heavy rains, corn is occasionally drowned out on poorly and somewhat poorly drained soils of first bottoms, and in this kind of weather cotton develops excess foliage and is more

subject to boll-weevil infestation. Crops on light sandy soils are damaged more from the lack of moisture than those on many of the heavier soils. The snowfall is very light and remains on the ground for only a brief time.

The rainfall reaches a peak in winter and another in midsummer. Fall is the driest season of the year. About half of the annual rainfall comes in quantities of 1 inch or more in a 24-hour period (*14*).

Water Supply

The water supply is generally adequate for farm and home use. A shortage sometimes occurs during September, October, and November. Wells and springs provide water for the farm homes. The wells are dug about 40 to 60 feet deep and usually have a dependable supply of water throughout the year. Springs, branches, creeks, farm ponds, and larger streams are the main source of water for cattle and other livestock. A municipal water system is rapidly expanding in the county, but many outlying areas still depend on wells and springs. The county has an abundance of artificial lakes for fishing, boating, and swimming. Many irrigation systems have been installed in recent years. Water for irrigation is supplied by streams and lakes.

Vegetation

The original oak-pine forest that covered the county was typical of a broad forested area extending eastward and southward from the Appalachian Mountains to the Coastal Plain (*10*). The present tree growth is similar to the original, but it is less extensive. The largest forests are now confined to hilly and steep lands that border the Chattahoochee River and its larger tributaries. Almost every farm of the county, however, has a woodlot.

In the forest the dominant oak species are white, common red, scarlet, black, and blackjack. Shortleaf is the chief pine; scrub and loblolly pines occur in small numbers. Common plants in the undergrowth are flowering dogwood, greenbrier, wild rose, and blackberry.

Abandoned fields are covered with broomsedge and, in places, bermudagrass. Areas that are not burned over frequently are gradually taken over by pine and scattered sassafras or oak. Fulton County has a good fire control system, and fires are kept at a minimum.

Scientific and common names of some of the trees and woody plants in the county are as follows:

Scientific name	*Common name*
Cornus florida	Flowering dogwood.
Pinus echinata	Shortleaf pine.
P. taeda	Loblolly pine.
P. virginiana	Virginia pine.
Quercus alba	White oak.
Q. coccinea var. *tuberculata*	Scarlet oak.
Q. marilandica	Blackjack oak.
Q. rubra	Southern red oak.
Q. velutina	Black oak.
Rosa sp.	Rose.
Rubus sp.	Blackberry.
Smilax sp.	Greenbrier.

Settlement and Population

Fulton County was created by an act of the State Legislature in 1853 from a part of De Kalb County. In 1932 Milton and Campbell Counties were merged with Fulton County by an act of the State Legislature and the vote of the people in each county. The land in the county lying south of the Chattahoochee River was acquired from the Creek Indians in 1821, and that north of the river was acquired in 1835 by treaty with the Cherokee Indians (*3*).

A group of families from Franklin County settled near the present site of Ben Hill in 1822. Other settlers probably came to the county at about this time. The first settlers were mainly from other parts of the State and were of English, Scottish, Irish, and French descent. After the Revolutionary War a large number of people came from other States.

Fulton County had a population of 473,572 in 1950. The urban population was 407,076. The average number of persons to the square mile was 905.5. Atlanta, East Point, College Park, and Hapeville are the most populous places in the county. In 1950 they had populations as follows: Atlanta, 331,314; East Point, 21,080; College Park, 14,535; and Hapeville, 8,560. Smaller places and their populations are: Roswell, 2,123; Fairburn, 1,889; Palmetto, 1,257; Union City, 1,490; and Alpharetta, 917.

Industries

Fulton County has many industries. Some of the major industries produce textiles, chemicals, iron and steel, fertilizers, food products, furniture, paper and paper products, soft drinks, and confectionary. The printing and publishing business employs many people. In 1948 branch factories, warehouses, or branch offices of 3,150 nationally known business organizations were located in Atlanta, according to the Atlanta Chamber of Commerce.

No single industry is dominant in the county. Most of the industries are in Atlanta and its suburbs. Many of the rural population work in the city. Some of them operate small farms with hired help or tenants.

Transportation and Markets

Atlanta is the transportation and communication center of the southeastern United States. The third largest telegraph and telephone switching center in the world serves the city. Transportation in Atlanta and suburbs is furnished by buses and trackless trolleys, and bus routes serve the nearby towns. Federal-State highways and State highways serve the county. There are many miles of paved roads, and the gravel and graded roads are kept in good condition. In 1950, 854 farms were located on hard-surfaced roads; 135 on gravel, shell, or shale roads; and 1,069 on dirt or unimproved roads.

Atlanta, Decatur, Palmetto, Fairburn, Roswell, and Alpharetta are principal markets for agricultural products. Vegetables are sold to Atlanta stores and

homes and also at markets in Atlanta for wider distribution. Cattle are sold in Atlanta for slaughter in packing houses.

Community Facilities

Fulton County has 81 elementary schools and 11 high schools. As of 1949, more than 500 churches were located throughout the county. In Atlanta there are 54 elementary schools, 9 high schools, and 22 schools of college level. There are also 15 hospitals, 12 related institutions, and 12 clinics.

Recreational facilities include golf courses and several county or privately operated parks with swimming and picnic accommodations.

Agriculture

The first Europeans to visit this area found well-organized Indian tribes located in permanent communities and engaged in the cultivation of maize, beans, pumpkins, melons, and many kinds of fruits. They had also developed great skill in making utensils, agricultural implements, weapons, and ornaments of copper, stone, and other materials (*3*).

The agriculture of the early settlers was self-sufficing. The chief crops were corn, wheat, oats, barley, and rye, supplemented by garden vegetables and fruit. Cattle, hogs, and sheep were raised for meat. Wool was spun and woven for clothes. Transportation was slow. Boats and pack horses carried most of the products traded, and frequently the settlers walked long distances to market their produce or trade their cattle. Most of the labor was performed by the family, but one family could cultivate only a few acres by the crude methods used. The sandy soils were preferred for agriculture, as they were most easily worked with the available implements.

Gradual development of transportation and high prices for cotton during the early 1830's rapidly changed this self-sufficient type of agriculture into a one-crop system. Short-staple cotton soon became the cash crop. Clean cultivation on moderately to steeply sloping land and high rainfall rapidly depleted soil fertility and accelerated erosion. When the land had deteriorated to the extent that yields were low, the farmers would abandon their fields and clear new land.

Agriculture is now well diversified. It consists of the growing of subsistence crops, chiefly corn, oats, wheat, and hay. Cotton is the chief cash crop. Vegetables for home gardens and truck crops are extensively grown, and fruit trees are kept on many farms, mainly for home use. The livestock industry consists principally of dairying and poultry raising. Some beef cattle and hogs are raised.

Land Use

The aggregate land in farms in 1950 was 158,206 acres, or 47.3 percent of the county. The acreage in farms was divided as follows: Cropland harvested, 38,364 acres; plowable pasture, 9,969; woodland, 69,004; and all other land, 40,869. The nonfarm land is to some extent in urban uses and large estates.

Type and Size of Farms

Most of the farmers grow products primarily for home use. According to the 1950 census, the 2,087 farms in the county were divided as follows:

	Number
Field crop	273
Vegetable	24
Dairy	30
Poultry	351
Livestock	60
General farms	62
Miscellaneous and unclassified	1,287

In 1950 the farms in the county ranged in size from less than 10 to more than 1,000 acres. Their average size was 75.8 acres. The large farms are predominantly along the Chattahoochee River terraces and bottoms, along some of the larger streams in the northwestern part of the county, on uplands near Alpharetta and Roswell, and in the vicinity of Palmetto and Fairburn. A few are in other parts of the county. The equivalent of 1-, 2-, and 3-horse farms are widely scattered over the agricultural areas.

Crops

Although the acreage planted to various crops has fluctuated, it has generally increased, partly because of the annexation of land from other counties. Corn decreased in acreage between 1939 and 1949. The acreage of oats and hay increased in this period. Cotton acreage has fluctuated considerably; in 1949 it was nearly half that in 1939. The acreage of the principal crops in stated years is shown in table 2.

Corn is the most extensively grown crop, but not enough is produced to feed the work animals, cows, poultry, and hogs in the county. A small quantity of corn is ground for home use. Oats and wheat are mostly grown in small fields, principally for farm use.

Truck crops produce some income on many farms. In 1949 vegetables were harvested for sale from 1,043 acres as follows: Green beans, 125 acres; cabbage, 17 acres; sweet corn, 138 acres; green peas, 13 acres; tomatoes, 88 acres; and all other vegetables and melons, 662 acres.

Orchard fruits, grapes, and small fruits are produced to supply home needs, and many farms have small surpluses for local markets. Boxwood and ornamental plants are grown on some farms as a source of supplemental income.

Rotations and Fertilizers

Farmers getting the best results use variations of a corn-cotton-small grain-hay rotation. Nevertheless many farmers plant row crops year after year on the same land.

In 1940 about 61 percent of the farmers reported

TABLE 2.—*Acreage of principal crops and number of bearing fruit trees and grapevines in Fulton County, Ga., in stated years*

Crop	1929	1939	1949
	Acres	*Acres*	*Acres*
Corn harvested for grain	4,085	26,114	14,764
Oats threshed	55	1,833	2,097
Wheat threshed	25	1,370	696
Cowpeas, harvested for peas	(1)	996	194
Hay (total)	504	5,523	6,102
Lespedeza	(1)	426	2,435
Timothy and (or) timothy and clover mixed	4	13	137
Alfalfa	58	444	835
Other tame hay and grasses	65	161	909
Grains cut green	178	695	866
Legumes cut for hay	175	3,674	854
Corn cut for silage	164	227	66
Potatoes	58	228	28
Sweetpotatoes and yams	440	759	298
All other vegetables harvested for sale	1,350	1,678	1,043
Cotton	2,231	13,249	7,705
	Number	*Number*	*Number*
Apple trees	4,453	17,785	6,778
Cherry trees	183	797	296
Fig trees	859	1,734	881
Peach trees	6,618	20,460	6,541
Pear trees	596	1,900	842
Pecan trees	[2] 177	1,037	572
Plum and prune trees	263	1,028	382
Grapevines	1,314	4,321	8,777

[1] Not reported.
[2] Cultivated or wild.

purchase of fertilizer. Only 41 farms reported purchase of lime. The use of lime and liming materials has since increased. Cotton is the chief crop fertilized; corn and small grain are fertilized to a lesser extent.

Permanent Pastures

Most pastures in 1949 were of poor quality, and the common plants were broomsedge, crabgrass, common lespedeza, and bermudagrass. The trend since that time is toward more and better pastures. Many farmers are increasing pasture yields by proper seeding and adequate fertilization. By 1956 some irrigation of pasture was being practiced, with good results. Much of the farm acreage is used for permanent pasture to offset the shortage of help. More farmers are supplementing their income by the sale of cattle and dairy products.

Livestock and Livestock Products

Production of livestock and livestock products is a minor enterprise in the county. Most farmers do not have enough fenced pasture to keep large herds. However, the increased acreage in oats and forage crops and the improvement in pastures are evidence of greater production of feed for livestock. A number of farms produce milk and other dairy products for local and Atlanta markets. In 1949, 390 farms reported dairy products sold. A total of 8,587 cattle and calves also was reported, of which 3,203 were milk cows. Although grade Jerseys predominate, some registered Jersey and Guernsey cattle are kept by dairy farmers.

In 1950 there were 8,299 hogs and pigs in the county. Brood sows are kept on only a few farms. Most farmers buy one or two pigs to be raised for home use. Few sheep and lambs are raised. The sale of poultry and poultry products was reported by 822 farms in 1950. Nearly 2 million chickens were sold on commercial farms, and more than 23,000 on other farms.

Farm Power and Mechanical Equipment

In the 1950 census, 1,545 mules and 557 horses were reported. Light work animals, weighing from 1,000 to 1,300 pounds, are preferred. Replacements for work animals are raised on a few farms. A decrease in work stock is attributed to a greater use of mechanized equipment, such as automobiles, motortrucks, and tractors. In 1950 there were 1,307 automobiles on 1,131 farms reporting; 655 motortrucks on 514 farms reporting; and 626 tractors on 452 farms reporting.

Mechanical equipment on 2-horse farms includes turnplows (moldboard and a few disk plows), disk and peg-tooth or drag harrows, mowing machines, hayrakes, cultivators, and, on a few farms, horse-drawn grain binders. Equipment on 1-horse farms includes the following: Turnplows, bull-tongue plows, spring-toothed harrows, fertilizer distributors, and seed planters. Tractor equipment includes moldboard plows or disk plows, disk and spring-tooth harrows, 2-row planters, 2-row cultivators, combines, mowing machines, and hayrakes. A few farms have manure spreaders and hay balers.

Farm Tenure

In 1950 full owners operated 1,392 farms, or 66.7 percent of the farms of the county; part owners 124, or 5.9 percent; managers 16, or 0.8 percent; and tenants 555, or 26.6 percent. The kind and number of tenants in 1950 were as follows: Cash tenants, 105; share-cash tenants, 4; share tenants, 119; croppers, 223; and other tenants, 104.

Of all the land in farms, full owners operated 96,715 acres in 1950; part owners, 11,856 acres; and managers, 11,583 acres. Tenants operated 38,052 acres, and of this total, cash tenants operated 7,324 acres; share-cash tenants, 154 acres; share tenants, 8,130 acres; other and unspecified tenants, 9,599 acres; and croppers, 12,845 acres. Full owners harvested 19,060 acres of cropland in 1949; part owners, 3,315 acres; managers, 4,165 acres; and all tenants, 11,824 acres.

In the prevailing systems of share rental, the share tenant furnishes work animals and tools, three-fourths of the cotton fertilizer and seed, and two-thirds of the corn fertilizer and seed corn. He receives proceeds from three-fourths of the cotton and two-thirds of the

TABLE 3.—*Soil series of Fulton County, Ga., grouped by topographic position, parent material, and drainage*

Parent material	Excessively drained	Somewhat excessively drained	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
SOILS OF UPLANDS						
Residuum from weathering of—						
Gneiss or granite, or mica schist in places.	Cecil	Cecil	Cecil			
Porphyritic granite	Lockhart	Lockhart	Lockhart			
Granite or gneiss; mica schist in places	Louisburg, Appling	Louisburg, Appling	Appling			
Aplitic granite, with diorite in places					Helena	
Mica schist or quartz mica schist	Louisa, Madison	Louisa, Madison, Grover [1]	Louisa, Madison, Grover [1]			
Hornblende schist or diorite		Davidson [2]	Davidson [2]	Mecklenburg	Iredell	
Basic rock and granite, gneiss or mica schist mixed.	Lloyd	Lloyd	Lloyd			
SOILS OF COLLUVIAL SLOPES						
Local colluvium and alluvium washed chiefly from—						
Appling and Cecil soils						Worsham.
Appling, Cecil, and Madison soils			Seneca			
Lloyd, Davidson, Cecil, and Madison soils.			Starr			
SOILS OF STREAM TERRACES						
Old alluvium on high stream terraces	Molena, Hiwassee	Molena, Hiwassee	Hiwassee			
Moderately young alluvium on low stream terraces.		Altavista	Wickham, Altavista	Altavista	Augusta	
SOILS OF FIRST BOTTOMS						
Young alluvium	Buncombe		Congaree		Chewacla	Wehadkee.

[1] In some areas the parent rock of the Grover series is highly micaceous gneiss.

[2] Hornblende schist is the principal parent rock of the Davidson series in this county.

corn. He also has use of land for a garden and forage crops, a house and outbuildings, and woodlot.

The sharecropper is furnished work stock, tools, and usually a small cash loan each month to be repaid when the crop is sold. He receives half of the net proceeds when the crop is sold and also has the use of the farm buildings.

In most instances contracts are made on a yearly basis and renewed at the end of each year. The length of time a tenant remains on a farm varies widely. About one-third of the tenants move every year.

Farm Buildings and Farm Home Conveniences

On some of the farms, especially those on the better soils, the buildings are in excellent repair. On the farms where the occupants move frequently, most of the buildings are unpainted wooden structures without modern conveniences, and they are usually in poor condition.

Rural mail routes serve all the communities. In 1950, 1,914 farms had electricity from a power line. In the same year 583 farms had telephones and 978 had running water.

The Soils of Fulton County

Differences in suitability of the soils have affected the agriculture of Fulton County. For example, the well-drained Congaree soils on the first bottoms are well suited to corn, whereas the poorly drained Wehadkee soils, which are associated with them along the streams, are poorly suited to corn.

The Cecil, Madison, Appling, and Lloyd soils, dominant on the smooth uplands near Roswell and Alpharetta, are among the better soils of the county. Their favorable internal and external characteristics have

stimulated the development of general farming as well as special types of farming. Consequently, better economic conditions prevail on farms on these soils than in areas where the soils have unfavorable characteristics.

Soils having rolling to hilly slopes have been seriously damaged by erosion in many areas, and as a result much of this land is idle. The steep deeply dissected areas—dominantly Louisa and Louisburg soils—are conspicuous for their lack of crops. They are mainly in forest, to which use they are best suited.

Much of the land under cultivation, as well as that once tilled and abandoned, is eroded to various degrees. About half of the area of the county shows moderate erosion, and severe erosion occurs on about 5,600 acres—usually on steep and hilly slopes.

In many places the stream channels have filled with sand washed from the upland slopes. During high water some of this sandy material has spread over the original dark silt loam and buried it. Thus, these once fertile and productive soils of the first bottoms have become almost worthless for farming. Furthermore the water table has risen in places, so that the land is too wet for crops much of the time.

Differences in the physical and chemical characteristics of the soils can be attributed largely to differences in their parent materials. Relief also influences soils. One indication of such an influence is the thick well-developed subsoil of the nearly level soils, as contrasted to the thinner subsoils of the sloping phases of these same soils. Erosion may influence soils by altering or removing the surface layer.

Soil Series and Their Relations

The soils of Fulton County are classified in 24 series and 10 miscellaneous land types. The series are grouped according to their position on the landscape as follows: (1) Soils of uplands, (2) soils of colluvial slopes, (3) soils of stream terraces, and (4) soils of first bottoms (table 3).

The soils of uplands have formed from material weathered from bedrock. The soils of colluvial lands have formed from materials washed or sloughed from adjacent slopes and deposited on lower slopes, or from local alluvium along drainageways. Soils of stream terraces are from alluvium deposited on benchlike positions bordering first bottoms, although some occupy remnants of old terraces. Soils of the bottom lands occupy the nearly level positions near streams and consist of waterborne material. They are subject to overflow by the adjacent streams. Miscellaneous land types are composed of areas having no true soil; ten have been mapped in the county.

Soil Series, Types, and Phases

In the following pages the soils of Fulton County, identified by the symbols used on the soil map and by symbols showing their management group, are described in detail. Their relations to agriculture are discussed, including present use and management, use suitability, and management requirements. The areas occupied by the various kinds of soil are shown on the soil map that accompanies this report. The approximate acreage and proportionate extent of each soil mapped are listed in table 4. The estimated acreages of each soil cultivated, pastured, forested, and idle are also given in this table 4.

ALTAVISTA SERIES

The Altavista soils occur on low stream terraces and are moderately well drained to well drained. They are associated with Augusta and Wickham soils. They differ from Augusta soils in having a less heavy subsoil, somewhat better drainage, and usually a higher level of productivity. They differ from Wickham soils in having a light brownish profile, less favorable drainage, and, on the whole, a lower level of productivity. Slopes range from level to rolling but are dominantly undulating.

Altavista soils are deep to parent materials that differ significantly in derivation. They are generally low in organic-matter content and range from medium to strongly acid. They are used mainly for cultivated crops and pasture, but productivity is medium to low under the soil management usually practiced.

Altavista fine sandy loam, undulating phase (2 to 6 percent slopes) (Ab).—This friable moderately well-drained soil is associated with the reddish Wickham soils of the low stream terraces and in places it is subject to overflow during periods of exceptionally high water. It has formed from moderately young alluvium consisting of materials washed from Cecil, Appling, Madison, Davidson, and related soils. The largest areas are in the northeast near the Chattahoochee River. The total acreage is fairly small, yet the soil is suited to many crops and is valuable to the farms on which it occurs.

Profile in a cultivated area:

Surface soil—
0 to 12 inches, light olive-brown very friable fine sandy loam; weak medium crumb structure.

Subsoil—
12 to 25 inches, olive-yellow, firm, heavy fine sandy clay loam; moderate medium blocky structure.
25 to 48 inches, light olive-brown friable fine sandy clay loam; moderate number of red distinctly visible medium-sized mottles, or color patches; moderate fine blocky structure.

Underlying material—
48 inches +, varicolored alluvial material consisting principally of sand, silt, clay, and a little gravel.

The soil varies somewhat in color, texture, consistence, and thickness of the surface soil and subsoil layers. In some areas a few mica flakes occur throughout the profile.

This soil is inherently low in supply of plant nutrients. It has medium to slow runoff and medium internal drainage. The surface soil has moderately rapid permeability, and the subsoil moderate to slow. The soil is moderately retentive of moisture and applied plant nutrients.

In nearly half of the mapped area, the soil has been moderately eroded. The remaining surface layer is about 3 to 6 inches thick. In the thinnest areas subsoil material has been mixed in the plow layer by tillage, and the surface layer is more clayey and some-

TABLE 4.—*Acreage in cultivated crops, pasture, forest, and idle, and the total acreage and the proportionate extent of soils mapped in Fulton County, Ga.*

Soils	Cultivated crops	Pasture	Forest	Idle	Total	
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Percent*
Altavista fine sandy loam:						
Eroded rolling phase	334	203	66	66	669	0.2
Level phase	201	67	33	33	334	.1
Undulating phase	802	266	135	135	1,338	.4
Appling sandy clay loam:						
Severely eroded hilly phase	150	452	1,506	904	3,012	.9
Severely eroded rolling phase	50	151	502	301	1,004	.3
Appling sandy loam:						
Eroded hilly phase	2,411	803	3,218	1,606	8,033	2.4
Eroded rolling phase	7,364	5,523	1,841	3,681	18,409	5.5
Eroded undulating phase	2,511	1,003	503	1,003	5,020	1.5
Hilly phase	435	435	3,481	0	4,351	1.3
Rolling phase	835	336	166	336	1,673	.5
Steep phase	0	184	3,313	184	3,681	1.1
Undulating phase	334	134	67	134	669	.2
Augusta fine sandy loam	66	6	6	55	133	(1)
Buncombe loamy fine sand	46	46	140	102	334	.1
Cecil clay loam:						
Severely eroded hilly phase	1,607	1,607	8,033	4,819	16,066	4.8
Severely eroded rolling phase	402	402	2,008	1,204	4,016	1.2
Severely eroded steep phase	0	67	535	67	669	.2
Cecil sandy loam:						
Eroded hilly phase	6,698	2,233	8,930	4,465	22,326	6.8
Eroded rolling phase	23,980	7,994	3,996	3,996	39,966	12.1
Eroded steep phase	67	134	1,003	134	1,338	.4
Eroded undulating phase	5,022	1,674	836	836	8,368	2.5
Hilly phase	736	736	5,891	0	7,363	2.2
Rolling phase	904	603	1,505	0	3,012	.9
Steep phase	0	318	5,723	318	6,359	1.9
Undulating phase	401	134	67	67	669	.2
Chewacla fine sandy loam	803	603	401	201	2,008	.6
Chewacla silt loam	2,410	1,807	1,205	602	6,024	1.8
Congaree fine sandy loam	2,510	670	167	0	3,347	1.0
Congaree silt loam	2,008	535	134	0	2,677	.8
Davidson clay loam:						
Eroded hilly phase	167	99	34	34	334	.1
Eroded rolling phase	468	134	67	0	669	.2
Eroded undulating phase	70	20	10	0	100	(1)
Grover fine sandy loam:						
Eroded hilly phase	40	20	10	30	100	(1)
Eroded undulating phase	202	66	33	33	334	.1
Gullied land	0	33	168	133	334	.1
Helena sandy loam, eroded rolling phase	101	67	65	101	334	.1
Hiwassee-Louisa soils, eroded hilly phases	0	34	266	34	334	.1
Hiwassee sandy loam:						
Eroded rolling phase	468	135	33	33	669	.2
Eroded undulating phase	241	69	17	17	344	.1
Iredell stony clay loam, rolling phase	168	102	32	32	334	.1
Lloyd clay loam:						
Eroded steep phase	0	17	283	34	334	.1
Severely eroded hilly phase	0	184	3,129	368	3,681	1.1
Severely eroded rolling phase	0	50	854	100	1,004	.3
Lloyd gravelly sandy loam, eroded steep shallow phase	16	34	250	34	334	.1
Lloyd sandy loam:						
Eroded hilly phase	1,874	1,406	937	469	4,686	1.4
Eroded rolling phase	4,619	2,712	903	903	9,037	2.7
Eroded undulating phase	1,205	401	201	201	2,008	.6
Hilly phase	33	100	536	0	669	.2
Rolling phase	200	66	34	34	334	.1
Steep phase	0	51	902	51	1,004	.3
Lockhart-Cecil clay loams:						
Severely eroded hilly phases	804	804	4,015	2,410	8,033	2.4
Severely eroded rolling phases	134	134	669	401	1,338	.4
Severely eroded steep phases	0	67	535	67	669	.2
Lockhart-Cecil sandy loams:						
Eroded hilly phases	703	235	936	469	2,343	.7
Eroded rolling phases	3,414	1,138	569	569	5,690	1.7
Eroded steep phases	34	66	503	66	669	.2
Eroded undulating phases	401	134	67	67	669	.2
Hilly phases	67	67	535	0	669	.2
Steep phases	0	117	2,109	117	2,343	.7

TABLE 4.—*Acreage in cultivated crops, pasture, forest, and idle, and the total acreage and the proportionate extent of soils mapped in Fulton County, Ga.—Continued*

Soils	Cultivated crops	Pasture	Forest	Idle	Total	
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Percent*
Louisa fine sandy loam:						
Eroded hilly phase	0	67	1,204	67	1,338	0.4
Eroded steep phase	0	184	3,313	184	3,681	1.1
Rolling phase	66	34	200	34	334	.1
Steep phase	0	284	5,122	284	5,690	1.7
Louisburg sandy loam:						
Hilly phase	0	134	2,409	134	2,677	.8
Rolling phase	51	51	802	100	1,004	.3
Steep phase	0	318	5,723	318	6,359	1.9
Made land					334	.1
Madison clay loam:						
Severely eroded hilly phase	218	653	2,174	1,306	4,351	1.3
Severely eroded rolling phase	66	201	669	402	1,338	.4
Madison fine sandy loam:						
Eroded hilly phase	1,807	603	2,409	1,205	6,024	1.8
Eroded rolling phase	6,165	2,055	1,028	1,028	10,276	3.2
Eroded undulating phase	2,007	670	335	335	3,347	1.0
Hilly phase	100	100	804	0	1,004	.3
Rolling phase	100	67	167	0	334	.1
Steep phase	0	66	1,206	66	1,338	.4
Madison gravelly sandy loam:						
Eroded rolling phase	1,205	401	201	201	2,008	.6
Rolling phase	301	201	502	0	1,004	.3
Madison-Grover-Louisa gravelly clay loams, severely eroded hilly phases	0	101	1,806	101	2,008	.6
Madison-Grover-Louisa gravelly sandy loams:						
Eroded hilly phases	100	302	1,004	602	2,008	.6
Hilly phases	101	101	802	0	1,004	.3
Steep phases	0	67	1,204	67	1,338	.4
Mecklenburg gravelly clay loam, eroded hilly phase	100	100	67	67	334	.1
Mecklenburg gravelly sandy loam, eroded rolling phase	166	100	34	34	334	.1
Mixed alluvium:						
Poorly drained	0	167	1,339	167	1,673	.5
Somewhat poorly drained	302	1,205	1,053	452	3,012	.9
Well drained	2,485	2,983	2,982	1,491	9,941	2.7
Molena loamy sand:						
Eroded undulating phase	40	26	27	40	133	(1)
Light colored variant	101	67	67	99	334	.1
Riverwash	0	0	100	0	100	(1)
Seneca fine sandy loam:						
Level phase	402	133	67	67	669	.2
Undulating phase	2,209	736	368	368	3,681	1.1
Starr loam:						
Level phase	401	134	67	67	669	.2
Undulating phase	603	201	100	100	1,004	.3
Stony land:						
Hilly	0	0	2,008	0	2,008	.6
Rolling	0	0	334	0	334	.1
Steep	0	0	1,338	0	1,338	.4
Unclassified city land					20 739	6.2
Wehadkee fine sandy loam	84	335	919	335	1 673	.5
Wehadkee silt loam	102	401	1,104	401	2 008	.6
Wickham fine sandy loam:						
Eroded undulating phase	233	67	17	17	334	.1
Undulating phase	467	134	34	34	669	.2
Worsham sandy loam:						
Eroded rolling phase	66	134	436	33	669	.2
Eroded undulating phase	33	67	217	17	334	.1
Undulating phase	167	335	1,088	83	1,673	.5
Total					334,720	100.0

[1] Less than 0.1 percent.

what heavier than elsewhere. Other characteristics of this eroded soil are about the same as those of the uneroded areas, and use suitability is similar.

Use and management (Group A–3)[4].—Corn and cotton are the principal crops; small grains and hay are also grown. Under common management average yields are low; they are higher under improved management. The soil has very good workability. It can be cultivated over a wide range of moisture conditions and can be worked sooner after rains than the heavy red soils of the uplands. Conservability is good, and erosion control is comparatively easy.

This soil responds well to fertilizers and good management practices. Its productivity can be improved by turning under leguminous crops, by applying lime and large amounts of fertilizer, and by using suitable rotations. In the eroded areas longer rotations and other measures to control erosion may be needed. Crops well suited to this soil are corn, cotton, rye, oats, crimson clover, lespedeza, soybeans, cowpeas, grasses, potatoes, sweetpotatoes, melons and garden vegetables.

Altavista fine sandy loam, level phase (0 to 2 percent slopes) (As).—This soil is similar to Altavista fine sandy loam, undulating phase, in all physical characteristics, but it occupies level or nearly level areas. In many places the profile layers contain a few small mica flakes that vary in color, texture, consistence, and thickness. This soil is low in fertility. Surface runoff is slow, and erosion is not a serious hazard. Internal drainage is medium. Permeability is moderately rapid in the surface soil and moderate to slow in the subsoil. Moisture and applied plant nutrients are retained moderately well.

About 104 acres of Altavista silt loam, level phase, is mapped with this soil. This included soil occupies somewhat lower positions on stream terraces and has a finer texture and poorer drainage. It is faintly mottled in the lower part. Most of the included soil is cultivated, corn and hay are the chief crops.

Use and management (Group A–3).—Except on the included Altavista silt loam, level phase, the crops grown and the yields produced are similar to those on Altavista fine sandy loam, undulating phase. The two soils can be managed in the same way. Corn, hay, and pasture are the most suitable crops for Altavista fine sandy loam, level phase. This soil is very easy to work and conserve, but artificial drainage is needed in places.

Altavista fine sandy loam, eroded rolling phase (6 to 10 percent slopes) (Ac).—This soil has been subjected to moderate sheet erosion. The surface soil is olive-brown very friable fine sandy loam, 3 to 9 inches thick. In the more eroded areas where subsoil material has been mixed with the remaining surface soil by tillage, the soil to plow depth is light olive-brown to olive-brown, friable, heavy fine sandy loam. The subsoil and underlying material are similar to those of the undulating phase, but the subsoil generally is a little thinner.

This eroded soil is low in fertility. Runoff is medium to rapid, and erosion hazard is moderate to high. Internal drainage is medium. Permeability is moderate in the surface soil and moderate to slow in the subsoil. The capacity of the soil to retain moisture and applied plant nutrients is moderately good.

Mapped with this eroded soil is a total area of about 100 acres of Altavista fine sandy loam, rolling phase, from which only a small part of the surface layer has been lost. It is included because of its small acreage and the similar use suitability. An aggregate of about 8 acres of Altavista fine sandy loam, hilly phase, which has stronger slopes (10 to 15 percent gradient), is also included.

Use and management (Group A–4).—The principal crops on Altavista fine sandy loam, eroded rolling phase, are corn and cotton, although small grains (oats and rye), and hay crops are grown. Yields are usually somewhat lower than on Altavista fine sandy loam, undulating phase.

This eroded rolling phase is easily worked and fairly easily conserved. It responds to fertilizer and other amendments, and under proper management fertility can be raised to and maintained at a fairly high level. Long rotations having a maximum of close-growing crops, as well as contour plowing and terracing, should be used to control erosion on much of this soil.

APPLING SERIES

Appling soils constitute one of the major soil series of the county. They extend over an estimated 45,726 acres, or 13.7 percent of the county. They are grayland soils on upland positions that range from smooth interstream ridgetops to very strong slopes adjacent to drainageways. Relief is dominantly rolling to hilly, but some is undulating and some steep. Drainage is good to excessive and depends largely on character of the relief. The soils of this series are deep and have formed chiefly from weathered products of granite or gneiss rock, or in places from weathered products of mica schist. They are associated with soils of the Cecil series. They are unlike Cecil soils mainly in having a profile that is less red and in general more friable and in having undergone, for the most part, more leaching.

The soils of this series usually are low in organic-matter content and medium to strongly acid. Their fertility is low. Nearly twice as much of their acreage is in forest and cultivated land than is in pasture or idle land. Productivity for crops and pasture is medium to low.

Appling sandy loam, undulating phase (2 to 6 percent slopes) (Af).—This friable, light-colored, well-drained sandy soil occurs on smooth interstream ridges and mild slopes leading to drainageways. The surface soil is relatively thick.

Profile in a cultivated area:

Surface soil—
0 to 12 inches, grayish-brown friable sandy loam; weak fine crumb structure.

Subsoil
12 to 29 inches, yellowish-red firm sandy clay; moderate fine to medium blocky structure; plastic and sticky when wet, hard when dry.

[4] Numbers in parentheses refer to the management group in which the soil has been placed. These groups are discussed in the section, Management Groups.

29 to 53 inches, yellowish-red friable sandy clay having a moderate number of gray and red, distinct, medium-sized mottles; weak medium blocky structure.

Parent material—

53 inches +, reddish brown to gray, soft, partly decayed granitic rock.

Runoff is slow to medium, and erosion hazard is slight to moderate. Internal drainage is medium. Permeability is moderately rapid in the surface soil and moderate in the subsoil. The soil retains moisture and applied plant nutrients well.

Use and management (Group A–3).—Corn, small grains, lespedeza, and cotton are the principal crops. Yields under prevailing management are fairly low but can be greatly improved by better soil management. The mild slopes and friable sandy texture allow easy cultivation, and the soil can be plowed sooner after rains than the fine-textured red clay loam soils. Soil conservability is only fair, and productivity is medium to low.

The principal management problems on this soil are erosion control and the increase and maintenance of fertility. The soil responds well to fertilizer, lime, and other amendments. Short rotations are adequate. Contour plowing and terracing are advisable for erosion control. The soil is well suited to many crops, including corn, cotton, wheat, rye, crimson clover, lespedeza, cowpeas, soybeans, sorghum, sweetpotatoes, potatoes, vegetables, and peaches and other fruits.

Appling sandy loam, eroded undulating phase (2 to 6 percent slopes) (Ag).—This soil consists of undulating areas of Appling sandy loam that became moderately eroded after having been cleared and cultivated. The remaining surface soil varies from about 3 to 9 inches in thickness. In cultivated areas it ranges from grayish-brown friable sandy loam to yellowish-red friable sandy loam to heavy sandy loam in areas where subsoil material has been mixed with the plow layer by tillage. The subsoil, about 39 to 41 inches thick, is in the upper part yellowish-red firm clay and in the lower part yellowish-red friable sandy clay mottled with gray and red. The underlying parent material is composed of reddish-brown to gray, soft, partly decayed rock weathered chiefly from granite or gneiss.

The soil has slow to medium runoff and is slightly to moderately susceptible to further erosion. Internal drainage is medium. Permeability is moderately rapid to moderate in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate.

Some severely eroded areas, totaling about 238 acres, are mapped with this soil and indicated on the soil map by symbols. From these areas more than 75 percent of the surface soil has been lost. In a few places some of the subsoil has been removed.

Use and management (Group A–3).—The crops grown on Appling sandy loam, eroded undulating phase, are mainly corn, small grains, lespedeza, and cotton. Under the practices commonly used, average yields are relatively low. However, production can be improved by better management. This soil is very easy to work and fairly easy to conserve. It has medium to low productivity. It is suited to about the same crops as Appling sandy loam, undulating phase, and needs similar management.

Appling sandy loam, rolling phase (6 to 10 percent slopes) (Ah).—This soil is similar to Appling sandy loam, undulating phase, in color, texture, and consistence, but it differs in having stronger slopes and slightly thinner surface soil and subsoil layers. It occurs on fairly smooth interstream divides and moderate slopes leading to drainageways, but its aggregate area is relatively small.

The surface soil, about 11 inches thick, is grayish-brown friable sandy loam. The subsoil, about 40 inches thick, is yellowish-red firm sandy clay in the upper part and yellowish-red, mottled with gray and red, friable sandy clay in the lower part. The parent material, variable in thickness, is reddish-brown to gray, soft, partly decayed residuum from weathered granite or gneiss, or mica schist in places.

Runoff is medium to rapid, and the erosion hazard is moderate to high. Internal drainage is medium. Permeability is moderately rapid in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate.

Use and management (Group A–4).—The main crops grown on this soil are corn, small grains, lespedeza, and cotton. Yields under prevailing management are relatively low but can be improved by better farming practices. About 10 percent of this soil is in forest consisting mainly of second-growth loblolly pine and a few hardwoods.

Appling sandy loam, rolling phase, has good workability and fair conservability. It responds well to good management that includes proper liming and fertilizing. Contour plowing, terracing, and long rotations help to control erosion. The soil is well suited to about the same crops as Appling sandy loam, undulating phase.

Appling sandy loam, eroded rolling phase (6 to 10 percent slopes) (Ak).—This soil consists of moderately eroded areas that have lost 25 to 75 percent of the original surface soil through erosion. The remaining surface soil, about 3 to 9 inches thick, is grayish-brown friable sandy loam. In cultivated areas where the surface soil is thinner, the plow layer contains subsoil material brought up by the plow and is yellowish-red friable sandy loam to heavy sandy loam. The subsoil is similar to that of Appling sandy loam, undulating phase, except that it is slightly thinner. The parent material of the two soils is similar. Areas of this eroded rolling phase are associated with areas of Cecil soils throughout the county. The largest areas, however, are in the northern and southern parts.

Because of its large acreage, wide distribution, and extensive use for crops and pasture, the soil is useful for agriculture. It has medium to rapid runoff and is moderately to highly susceptible to further erosion. Internal drainage is medium. The surface soil has moderate to moderately rapid permeability, and the subsoil has moderate permeability. The soil is moderately retentive of moisture and applied plant nutrients.

A few small areas of Durham sandy loam, eroded rolling phase, are included with this soil because of their small extent. In these areas the surface layer is grayish-yellow friable sandy loam, about 3 to 11 inches thick. The 35-inch subsoil is yellow friable sandy clay

in the upper part and mottled in the lower part. The parent material is soft decayed granitic rock.

Use and management (Group A–4).—Most of Appling sandy loam, eroded rolling phase, is in crops and pasture. Some is idle and some is in forest. The chief crops on this soil are corn, small grains, lespedeza, and cotton. Yields of corn can be about doubled under improved management. Under good management other crops also produce greater yields. Small areas of this soil are in forest, principally second-growth shortleaf and loblolly pines and some hardwoods. The soil is easy to fairly easy to work and is easy to conserve.

The principal management problems are erosion control and the building up and maintaining of fertility. The soil responds well to good management, including adequate treatment with lime and fertilizer. Long rotations, contour plowing, and terracing, where feasible, are suitable for erosion control. The soil can be used for occasional row crops common to the area, but because of its erodibility, it is better suited to close-growing crops than to row crops.

Appling sandy loam, hilly phase (10 to 15 percent slopes) (Al).—This soil occupies upland slopes near or adjacent to drainageways. It has much stronger slopes than Appling sandy loam, undulating phase, and the surface soil and subsoil layers generally are thinner. Otherwise the two soils are similar.

The surface soil is grayish-brown friable sandy loam about 10 inches thick. The subsoil, about 37 inches thick, is yellowish-red firm sandy clay in the upper part and yellowish-red, mottled with gray and red, friable sandy clay in the lower part. The parent material in most places consists of reddish-brown to gray, soft, partly decomposed granite or gneiss, or mica schist in places.

Runoff is rapid and erosion hazard is high. Internal drainage is medium. The soil is low in fertility. Permeability is moderately rapid in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate.

Use and management (Group B–3).—This soil occupies a fairly large aggregate area. It is mainly in forest of second-growth loblolly and shortleaf pines and a few hardwoods. The cleared areas are about equally divided between cultivated land and pasture. Some of the common crops are grown, but under prevailing management yields usually are very low. The soil has poor workability and only fair conservability. Strong slopes, erodibility, and other unfavorable features restrict its use largely to pasture and forest.

Appling sandy loam, eroded hilly phase (10 to 15 percent slopes) (Am).—From 25 to 75 percent of the surface layer of this soil has been eroded. The remaining surface soil is from 3 to 8 inches thick. The plow layer is grayish brown to yellowish-red friable sandy loam to heavy sandy loam. The yellowish-red soil occupies areas in which the thin surface soil has been mixed with the subsoil during tillage. The subsoil and parent material are similar to those of Appling sandy loam, hilly phase.

This eroded soil has rapid runoff and is very susceptible to further erosion. Internal drainage is medium. Permeability in the surface soil is moderate to moderately rapid, and in the subsoil, moderate. The soil retains moisture fairly well.

Use and management (Group B–3).—Among the crops grown on this soil are corn, lespedeza, and cotton, but under common management the yields are usually very low. Productivity can be increased by improved management, but even the increased yields do not everywhere justify the methods necessary. Much of the soil is in forest composed principally of pines.

Largely because of its strong slopes, the soil is somewhat difficult to work. Nevertheless, it can be cultivated within a relatively wide range of moisture conditions without clodding. Because of its rapid runoff and easy susceptibility to further erosion, it is difficult to conserve. Nevertheless, it responds to good management that includes the use of lime and fertilizer. Where it must be used for cultivation, the needed management includes adequate fertilizing and liming, use of long rotations that include a maximum of close-growing crops, contour tillage, stripcropping, and terracing where feasible. The soil is fair for pasture. Pasture growth is improved by applying lime and fertilizer and by adequate seeding.

Appling sandy loam, steep phase (15 to 25 percent slopes) (An).—This soil comprises the steepest areas of Appling sandy loam and occupies short very strong slopes along drainageways.

In most places the surface soil is grayish-brown friable sandy loam about 9 inches thick. The upper part of the subsoil is yellowish-red firm sandy clay about 14 inches thick. The lower subsoil is yellowish-red, mottled with gray and red, friable sandy clay about 21 inches thick. This subsoil material is underlain by soft decayed granite or gneiss, or in places by mica schist.

Runoff is rapid to very rapid, erosion hazard is high to very high, and internal drainage is medium. Permeability is moderately rapid in the surface soil and moderate in the subsoil. The moisture-holding capacity of the soil is moderate.

Mapped with this soil is about 422 acres that has been moderately eroded and about 91 acres that has been severely eroded. The moderately eroded soil has lost 25 to 75 percent of its surface layer, whereas the severely eroded soil has lost more than 75 percent. These eroded areas are indicated on the soil map by symbol.

Use and management (Group C–1).—Most of the relatively small total area of Appling sandy loam, steep phase, is in forest. The forest consists principally of second-growth loblolly and shortleaf pines and some hardwoods. Pasture on this soil usually has a low carrying capacity. Poor to very poor workability and conservability and very low productivity make the soil generally unsuitable for crops and pasture. Forest is the best use for most of this steep phase.

Appling sandy clay loam, severely eroded rolling phase (6 to 10 percent slopes) (Ac).—This soil is associated with the rolling phases of Appling sandy loam, but severe erosion has removed all or almost all of its surface soil. As a result the surface layer is made up largely of subsoil material turned up by the plow during tillage.

Profile in a cultivated area:

Surface soil—
0 to 5 inches (plow layer), grayish-brown to yellowish-red friable sandy clay loam; weak fine crumb to moderate fine blocky structure.
Subsoil—
5 to 19 inches, yellowish-red firm sandy clay; moderate fine to medium blocky structure; plastic and sticky when wet, hard when dry.
19 to 43 inches, yellowish-red friable sandy clay; gray and red distinct medium mottles common; weak medium blocky structure.
Parent material—
43 inches +, reddish-brown to gray partly decomposed granite or gneiss, or mica schist in places.

Runoff is medium to rapid, and the hazard of further erosion is moderate to high. Internal drainage is medium and permeability is moderate. However, the runoff is so great on the exposed subsoil, and such a small proportion of rain water soaks in, that the soil tends to dry out readily.

Use and management (Group B–1).—Little of this soil is cultivated. Some is in pasture or is idle, and a large part is in pine forest. Corn, lespedeza, and cotton are grown on a few areas of this soil, but yields are very low under the management commonly practiced. Under good management improved yields can be expected but would be relatively low for most crops. The soil has only fair workability, and the moisture range satisfactory for cultivation is narrow.

Severe erosion, poor physical condition, tendency toward droughtiness, difficult erosion control, and poor productivity limit feasible use of this soil to pasture or forest. If more of it must be used for crops, long rotations with a maximum of legume hay crops are needed.

Appling sandy clay loam, severely eroded hilly phase (10 to 15 percent slopes) [Ae].—This phase comprises former areas of Appling sandy loam, hilly phase, from which accelerated erosion has removed nearly all or all the surface soil. In cultivated areas the plow layer consists almost entirely or entirely of subsoil material and is grayish-brown to yellowish-red friable sandy clay loam. Throughout the rest of its profile the soil is similar to the hilly phase of Appling sandy loam.

The strong slopes and exposed subsoil cause rapid runoff and restrict the quantity of moisture entering the soil. As a result of the low supply of moisture received, the soil tends to dry out readily.

Use and management (Group C–1).—The fairly small aggregate area of this soil is mostly in pine forest or lies idle. The soil has very poor workability, poor conservability, and very low productivity. Because of severe erosion, poor physical condition, tendency to droughtiness, and problems of erosion control, the soil is poorly suited to crops and pasture. It is best used for forest.

AUGUSTA SERIES

The Augusta soil is on low stream terraces but is not generally subject to overflow. It is associated with soils of the Altavista series but differs from them in having a grayish surface soil and somewhat poor drainage. Augusta soil is deep, but internal drainage is restricted to some extent by the slowly permeable subsoil. The organic-matter content usually is low, and the reaction is medium to strongly acid. The soil is used principally for cultivated crops and pasture. Productivity generally is low.

Augusta fine sandy loam (0 to 6 percent slopes) [Ao].—This soil has formed from moderately young alluvium derived from material washed from Cecil, Appling, Madison, Davidson, and related soils. Because of its very small aggregate area, the soil is of limited agricultural value.

Profile in a cultivated area:

Surface soil—
0 to 12 inches, light brownish-gray very friable fine sandy loam; very weak fine crumb structure.
Subsoil—
12 to 30 inches (claypan), light yellowish-brown firm fine sandy clay loam; moderate fine blocky structure.
30 to 36 inches (claypan), light-gray firm fine sandy clay; distinct medium mottles of white and brownish yellow are common; moderate fine blocky structure.
Underlying material—
36 inches +, mottled alluvial material.

The profile layers contain a few small mica flakes, and they vary somewhat in color, texture, consistence, and thickness. In some areas the underlying material is not alluvial but is composed of rock that decayed in place.

This soil is low in fertility. Runoff is medium to slow, and the erosion hazard is slight to moderate. The surface soil is moderately permeable and the subsoil slowly permeable. The soil retains moisture and applied plant nutrients moderately well.

Areas of Roanoke fine sandy loam, level phase, totaling about 21 acres, are mapped with this soil. They are included because of their close association with the Augusta soil and their limited extent. The surface soil is about 12 inches thick and is a very friable fine sandy loam of very weak fine crumb structure. The subsoil, about 24 inches thick, is light-gray firm to friable fine sandy clay. It has weak medium blocky structure and is sticky when wet. The underlying material is light-gray, friable, structureless fine sandy loam. The profile is medium acid throughout, contains a moderate to low quantity of organic matter, and retains moisture well. This included soil is better suited to pasture than to crops.

Use and management (Group A–6).—About half of this soil is cultivated, and about 40 percent is idle. The rest is in pasture and forest. Corn is the main crop. The yields average about the same as on the closely associated Altavista fine sandy loam, undulating phase, but vary widely according to moisture conditions. During wet years the excess moisture damages the crops, but during dry years the accumulated moisture left by poor drainage is beneficial. The soil cannot be cultivated so soon after rains as the associated Altavista soil.

This soil responds to fertilization and other appropriate management practices. It is suitable for corn, lespedeza, and pasture. Its productivity can be improved considerably by turning under leguminous crops to increase organic matter and by applying adequate lime and fertilizer. The poor drainage of this soil can be improved in places by digging shallow open ditches and plowing in small plots so water will drain.

BUNCOMBE SERIES

The deep Buncombe soil occurs on level to nearly level first bottoms that are subject to overflow by the streams. It is associated with soils of the Congaree, Chewacla, and Wehadkee series. It differs from them mainly in being made up largely of loose, porous fine sand throughout its depth and in being excessively drained.

The soil generally has a low organic-matter content and is medium acid. The greater part is in forest or idle, but some areas are cultivated or in pasture. Productivity for crops and pasture is very low.

Buncombe loamy fine sand (0 to 2 percent slopes) (Ba).—This sandy soil consists of almost unaltered young alluvium. It is loamy fine sand to depths of 36 inches or more. Except in color, it shows very little change throughout its depth.

A representative profile is as follows:

Surface soil
0 to 6 inches, yellowish brown very friable loamy fine sand; structureless.
Subsurface—
6 to 36 inches, reddish-yellow very friable loamy fine sand; structureless.
Underlying material
36 inches +, light yellowish brown to light-gray very loose fine sand.

The thickness of the profile layers varies somewhat from place to place.

This soil is low in fertility. Runoff is slow to very slow. The soil is not subject to ordinary erosion but receives new alluvial material from time to time. Some scouring by floodwater may occur. The very rapid permeability of the profile allows easy leaching, and the low moisture-holding capacity causes the soil to dry out readily.

Use and management (Group C–1).—Most of Buncombe loamy fine sand has at some time been cleared and farmed, but much is now in forest or idle. The soil has very good workability, fair conservability, and very low productivity. Excessive drainage, susceptibility to leaching, and other unfavorable features make almost all of the soil very poor for crops and pasture. With adequate fertilizer, it is good for peanuts, cowpeas, and watermelons. When fertilized it is an excellent soil for growing and harvesting coastal bermudagrass stolons.

CECIL SERIES

The Cecil soils cover the largest acreage in the county—an estimated 110,275 acres, or 32.9 percent of the total acreage. They occupy uplands, where they range from smooth interstream ridges to the very strong slopes along drainageways. These soils are well drained to excessively drained and are in various stages of erosion. They are distinguished by their red clay subsoil. For the most part, they have developed deep profiles from weathered rock material, mainly of gneiss or granite or in places of mica schist.

Cecil soils are associated with Appling and Madison soils, and in the southern part of the county, with Lockhart soils. They differ from Appling chiefly in their redder subsoil and usually firmer consistence, and from Madison in their less brown surface soil, firmer subsoil consistence, and smaller mica content.

The surface soil of the Cecil series varies somewhat in color, texture, consistence, and thickness, depending in a large measure on the degree of erosion.

The soils of this series are medium to strongly acid, usually low in organic matter, and low in fertility. They are used for cultivated crops, forest, and pasture. Some areas are idle. Productivity for crops and pasture is medium to very low.

Cecil sandy loam, undulating phase (2 to 6 percent slopes) (Cd).—This deep soil occurs throughout the county on smooth interstream ridges and mild slopes leading to drainageways. The separate areas are relatively small.

Profile in a forested area:

Surface soil—
0 to 8 inches, yellowish-brown friable sandy loam; weak fine crumb structure, layer has covering of forest litter (leaves and twigs) and leaf mold about 1½ inches thick.
8 to 11 inches, yellowish-red friable heavy sandy loam; weak medium crumb structure.
Subsoil—
11 to 27 inches, red firm clay; moderate medium blocky structure.
27 to 38 inches, red firm clay; moderate medium blocky structure; fair quantity of fine mica flakes.
Parent material—
38 to 50 inches +, red friable clay; moderate number of brownish-yellow distinct coarse mottles; contains small decomposed fragments of gneiss or quartz mica schist; some mica flakes.

The fertility of this soil is medium to low. Runoff is slow to medium, and internal drainage is medium. The soil is only slightly to moderately susceptible to erosion. Permeability is moderately rapid in the surface soil and moderate in the subsoil. The soil retains moisture and applied plant nutrients well.

Use and management (Group A–2).—The small aggregate area of Cecil sandy loam, undulating phase, is for the most part in cultivation. Some is in pasture, lies idle, or is forested. The forest consists mainly of red oak, dogwood, hickory, and pine.

The soil is easy to till. Because of its porosity it can be plowed sooner after rains than soil having heavier textured surface layers. It is easy to conserve and has medium to low productivity. Although its fertility is low, the soil responds readily to fertilization and other good management. Because of its favorable qualities, it can be kept highly productive. It is suited to many different crops, including corn, cotton, wheat, oats, rye, barley, crimson clover, lespedeza, cowpeas, soybeans, alfalfa, grasses, sweetpotatoes, potatoes, vegetables, and peaches.

Cecil sandy loam, eroded undulating phase (2 to 6 percent slopes) (Ce).—This soil differs from Cecil sandy loam, undulating phase, mainly in being moderately eroded. It has lost 25 to 75 percent of its surface soil. The remaining surface soil ranges from about 2 to 6 inches in thickness. In cultivated fields the plow layer is pale-yellow, reddish-brown, or red friable sandy loam to clay loam. Color and texture vary according to the proportion of red clay subsoil mixed with the surface soil during tillage. Clean-cultivated land has a spotted appearance because of the numerous red galled spots that occur in the fields.

This soil has slow to medium runoff and is moderately susceptible to erosion. Internal drainage is me-

dium. Permeability is moderately rapid to moderate in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate.

About 59 acres of Cecil clay loam, severely eroded undulating phase, is mapped with this soil. The included soil, not mapped separately in this county, has lost more than 75 percent of the original surface layer. The plow layer is red to reddish-brown friable clay loam. The subsoil is red, firm, heavy clay. These severely eroded areas are indicated on the soil map by symbol. The soil can best be used for deep-rooted perennial legumes or for trees.

Use and management (Group A–2).—Most of this soil is in crops and pasture. The rest is idle or in forest. The common crops of the county are grown. Under good management, variations of the corn-cotton-small grain-hay rotation are used. Many farmers, however, do not rotate crops but plant row crops year after year. Normally, yields of corn range from 15 to 40 bushels an acre, depending on the level of management.

The soil is easily worked, and improved farm machinery can be used in most places. Conservability is good, and productivity is medium to poor. The chief management requirements are building up and maintaining fertility. The soil responds well to fertilizer and to other soil amendments. Terracing, stripcropping, contour plowing, and crop rotations are needed for erosion control. Erosion is easier to control and shorter rotations can be used on this soil than on soils having stronger slopes. Because of its many favorable qualities, this soil is well suited to many kinds of crops. Suitable crops are corn, cotton, wheat, oats, rye, crimson clover, lespedeza, soybeans, cowpeas, alfalfa, sweetpotatoes, potatoes, and garden vegetables.

Cecil sandy loam, rolling phase (6 to 10 percent slopes) (Cf).—This soil occupies fairly smooth upland ridges and gradual slopes leading to drainageways. It has stronger slopes and generally a slightly thinner surface soil and subsoil than the undulating phase. Other characteristics of the two soils are similar.

The surface soil, about 10 inches thick, is yellowish-brown friable sandy loam in about the first 7 inches and yellowish-red friable heavy sandy loam in the lower 3 inches. The subsoil is red firm clay about 26 inches thick. Below this is the parent material of red friable clay, splotched or coarsely mottled with brownish yellow. The parent material contains mica flakes and small, soft, weathered fragments of gneiss and mica schist.

Runoff is medium to rapid on this soil, and the erosion hazard is moderate to high. Internal drainage is medium. Permeability is moderately rapid in the surface soil and moderate in the subsoil. The soil has moderate moisture-holding capacity and holds applied plant nutrients well.

Use and management (Group A–1).—Forest, consisting largely of red oak, dogwood, hickory, and pine, occupies about half of this phase. The rest is in crops and pasture. Corn, small grains, lespedeza, and cotton are among the chief crops. Corn more than doubles its average yield under improved management. The response of other crops under improved management is nearly as good as that of corn. Under the better farming practices, variations of the corn-cotton-small grain-hay rotation are used. On many areas crop rotations are not used and row crops are grown year after year.

Control of erosion and the building up and maintenance of fertility are the chief practices needed. Fertilizer and other soil amendments can be applied with good results. Erosion can be held in check by the use of terraces, stripcropping, contour tillage, and long rotations. Crops suitable for this soil are corn, cotton, wheat, oats, rye, barley, crimson clover, lespedeza, cowpeas, soybeans, alfalfa, grasses, sweetpotatoes, and potatoes.

Cecil sandy loam, eroded rolling phase (6 to 10 percent slopes) (Cg).—This is the most extensive soil in the county. It occurs on broad moderately smooth interstream divides and gradual slopes toward drainageways. Erosion has removed 25 to 75 percent of the surface layer; as a result, this layer is now only about 2 to 6 inches thick. Originally, the profile was similar to that of Cecil sandy loam, rolling phase.

To plow depth the soil is pale-yellow, reddish-brown, or red, friable sandy loam to clay loam. The color and texture of this layer depend on the quantity of red clay subsoil material that has been mixed into the plow layer by tillage. Clean-cultivated fields have a spotted appearance because numerous, small, eroded patches of red to reddish-brown clay or clay loam appear among the areas of pale-yellow sandy loam. The subsoil and parent material are similar to those of Cecil sandy loam, rolling phase.

This soil has medium to rapid runoff and moderate to high erosion hazard. Its internal drainage is medium. Permeability is moderately rapid to moderate in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate.

Use and management (Group A–1).—This is one of the most widely used soils in the county; practically all of it has been cleared and farmed. Most of this soil is cultivated. Some is in pasture, and a smaller part is idle or in forest. Many of the more eroded areas have been abandoned and are reverting to broomsedge, sassafras, and pine. All crops common to the county are grown. Under good management, including adequate fertilization, proper rotation of crops, and other good farming practices, crops make good response. For example, under prevailing management corn averages about 10 bushels an acre, but under the better practices it averages 30. The soil is easily worked, but it can be conserved only fairly easily because it is erodible. Productivity is medium to low.

The productivity of this soil can be built up to and kept at a good level. The soil is suited to crops similar to those grown on Cecil sandy loam, rolling phase. The chief management problems are control of erosion and maintenance of fertility. Helpful practices are proper use of fertilizer and other soil amendments, long rotations, terracing, stripcropping, and contour plowing.

Cecil sandy loam, hilly phase (10 to 15 percent slopes) (Ch).—This soil is similar to Cecil sandy loam, rolling phase, in color, texture, and consistence, but it has stronger slopes and slightly thinner surface soil and subsoil layers. For the most part it occupies positions near or adjacent to drainageways. Slopes are usually short and strong. Because of its hilly relief,

the soil is less desirable for cultivation than the rolling phase and is nearly everywhere subject to more erosion.

The 8-inch surface soil is yellowish-brown friable sandy loam in the first 5 inches and a yellowish-red, friable, heavy sandy loam in the bottom 3 inches. The subsoil is red firm clay about 25 inches thick. The underlying parent material is red friable clay, splotched or coarsely mottled with brownish yellow. It contains mica flakes and soft, weathered fragments of gneiss and mica schist.

Runoff is rapid on this soil, and the erosion hazard is high. Internal drainage is medium. Permeability is moderately rapid in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate.

Use and management (Group B–3).—Most of this soil is in forest consisting mainly of red oak, dogwood, hickory, and pine. A small percentage is cultivated or in pasture. The soil has poor workability, fair conservability, and low to very low productivity. It is better suited to pasture than to cultivated crops. With adequate fertilizers and lime, proper seeding, and other needed management, fair pasture can be grown. When additional areas must be used for cultivation, advisable soil management includes terracing where feasible, contour plowing, suitable fertilization, and use of long rotations made up mainly of close-growing crops.

Cecil sandy loam, eroded hilly phase (10 to 15 percent slopes) (Ck).—This is the second most extensive soil in the county. Erosion has removed about 25 to 75 percent of the sandy surface soil, and only about 2 to 6 inches of it remains.

To plow depth the soil is pale-yellow, reddish-brown, or red friable sandy loam to clay loam. In the redder heavier areas, the red clay subsoil material has been mixed into the plow layer by tillage. The subsoil and parent material have characteristics similar to those of corresponding layers in Cecil sandy loam, hilly phase.

This soil has rapid runoff and is very susceptible to further erosion. Internal drainage is medium. Permeability is moderately rapid to moderate in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate.

Use and management (Group B–3).—A large part of this soil is in second growth pine forest. Cleared areas are in crops and pasture or lie idle. Corn, lespedeza, and cotton are among the principal crops grown. The soil is better suited to pasture than to cultivated crops, and there is an increasing tendency to use more of it for grazing. On many farms, however, the soil must be cultivated because sufficient land of more favorable slope is not available.

The soil is difficult to work and fairly easy to difficult to conserve. It has low to very low productivity. Yields can be improved and maintained by stripcropping, contour tillage, use of long rotations, heavy applications of fertilizer, and terracing where practical.

Adequate fertilization, proper liming, suitable seeding, and other appropriate practices are needed to improve the pasture.

Cecil sandy loam, steep phase (15 to 25 percent slopes) (Cl).—This soil occupies breaks or very strong slopes adjacent to drainageways. The surface soil, about 7 inches thick, is yellowish-brown friable sandy loam for the first 5 inches and yellowish-red friable heavy sandy loam in the last 2 inches. In wooded areas the soil is usually covered with a layer of leaves, twigs, and leaf mold about 2 inches thick. The red firm clay subsoil is about 24 inches thick and somewhat micaceous in the lower part. Underlying the subsoil is the parent material, a red friable clay with mottles of brownish yellow. It contains mica flakes and small decomposed fragments of gneiss and mica schist.

This soil has rapid to very rapid runoff. The erosion hazard is high to very high. Internal drainage is medium. Permeability is moderately rapid in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate. A small part of this soil, approximately 113 acres, is very steep and has slopes of more than 25 percent.

Use and management (Group C–1).—The fairly large total area of Cecil sandy loam, steep phase, is nearly all in forest consisting mainly of red oak, dogwood, hickory, and pine. The rest is in pasture or is idle. The soil has poor to very poor workability and conservability and very low productivity. Steep slopes, erodibility, and other unfavorable features make this soil poor for crops and pasture. Nearly everywhere it is best used for forest.

Cecil sandy loam, eroded steep phase (15 to 25 percent slopes) (Cm).—Except for its eroded condition, this soil is similar to Cecil sandy loam, steep phase. It occupies areas of steep broken relief adjoining drainageways. Moderate erosion has removed 25 to 75 percent of the surface soil, so only about 2 to 5 inches of this layer remains. To plow depth the surface soil is pale-yellow, reddish-brown, or red friable sandy loam to clay loam. The color and texture vary according to the quantity of red clay subsoil material that has been mixed with the sandy loam surface soil by tillage

The soil has rapid to very rapid runoff and is very susceptible to further erosion. It has medium internal drainage. Permeability is moderately rapid to moderate in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate.

Use and management (Group C–1).—This steep phase has a small aggregate area. About three-fourths is in second-growth pine forest. A small part is cultivated, and the rest is idle or in pasture. Because of its steep slopes, easy erodibility, very poor workability and conservability, and very low productivity, this soil normally is not suited to crops or pasture. In most places it is best used for forest.

Cecil clay loam, severely eroded rolling phase (6 to 10 percent slopes) (Ca).—This soil comprises former areas of Cecil sandy loam, rolling phase, from which severe erosion has removed nearly all or all the original surface soil. The soil to plow depth is red to reddish-brown friable clay loam. The subsoil is red, firm, heavy clay, 21 to 24 inches thick. The parent material begins as red friable clay containing a relatively large quantity of mica flakes and grades into soft residual material from gneiss, granite, or mica schist.

Profile in a cultivated area:

Surface soil—
0 to 5 inches (plow layer), red to reddish-brown fri-

able clay loam; weak medium crumb to moderate medium blocky structure.

Subsoil—

5 to 22 inches, red, firm, heavy clay; moderate medium blocky structure.

22 to 29 inches, red, firm, heavy clay; moderate medium blocky structure; fair quantity of mica flakes.

Parent materia.—

29 inches +, red friable clay, considerable quantity of mica flakes.

Many small gullies and a few large ones have formed in this soil. Runoff is medium to rapid, and the hazard of further erosion is moderate to high. Internal drainage is medium. The soi. is moderately permeable and retains moisture moderately well.

Use and management (Group B–1).—This severely eroded rolling phase usually occurs in small tracts, but it has a fairly large aggregate area. About half of it is in pine forest. Most of the rest is idle, although some is in crops and pasture.

In cultivated areas the crops grown are mostly corn, lespedeza, and cotton. Yields are low under common management but can be improved by better practices.

This soil has poor workability, and because of its fine-textured clayey plow layer, it forms clods if not plowed when at proper moisture content. The soil is only fairly easily conserved and is low to very low in productivity. It is poorly suited to tilled crops and can be used best for pasture, or in the more severely eroded areas, for trees.

Cecil clay loam, severely eroded hilly phase (10 to 15 percent slopes) (Cb).—This soil generally occupies strong slopes near or adjacent to drainageways. Practically all or all of its original surface layer has been lost through erosion. Many gullies have developed. The present plow layer is red to reddish-brown friable clay loam consisting largely of subsoil material. The subsoil is red, firm, heavy clay about 20 to 22 inches thick. The parent material, beginning as red friable somewhat micaceous clay, grades at variable depths to soft, weathered gneiss, granite, or mica schist.

The soil has rapid runoff, and the hazard of further erosion is high. Internal drainage is medium. The soil is moderately permeable and has a moderate moisture-holding capacity.

Use and management (Group C–1).—About half of this soil is in pine forest. The rest is in crops and pasture or is idle. The soil is very difficult to work and difficult to conserve. Its productivity is very low. The hilly relief, severe erosion, and poor productivity make the soil generally unsuitable for crops or pasture. Forest therefore is its best use in most places.

Cecil clay loam, severely eroded steep phase (15 to 25 percent slopes) (Cc).—This soil consists of former areas of Cecil sandy loam, steep phase, that have lost all or nearly all the sandy surface soil through severe erosion. Gullies are numerous, and some have cut deeply into the parent material. The surface nearly everywhere is red, and where the soil is tilled the plowed layer consists of red friable clay loam. Below this is the red, firm, heavy clay subsoil. The subsoil is about 19 to 21 inches thick and is moderately micaceous in the lower part. The parent material, a red friable micaceous clay, grades into soft material weathered from gneiss, granite, or mica schist. In the few small areas, slopes are stronger than 25 percent.

Runoff on this phase is rapid to very rapid, and the erosion hazard is high to very high. Internal drainage is medium. The soil is moderately permeable and has a moderate moisture-holding capacity.

Use and management (Group C–1).—Most of this soil is in second-growth pines. The rest is pasture or idle land In nearly all places the soil is unsuited to crops and pasture because of its steep slopes, high erodibility, very poor workability and conservability, and very low productivity. For the most part, it is best used for forest.

CHEWACLA SERIES

The Chewacla soils are on level or nearly level first bottoms and are subject to periodic overflow by the streams. They are associated with the well-drained Congaree soils and the poorly drained Wehadkee soils, and in drainage are about intermediate between the two. Their profile has been poorly formed, and the layers show very little distinction except in color. Although the soils are deep, the water table fluctuates and at times is relatively high.

The soils usually have a moderate organic-matter content and are medium to strongly acid. Artificial drainage, where feasible, improves the usefulness of these soils. Productivity is high for crops and pasture, but flooding reduces yields, especially of cultivated crops.

Chewacla silt loam (0 to 2 percent slopes) (Co).—This somewhat poorly drained soil has formed as level or nearly level bottom land from young alluvial material derived from Cecil, Appling, Madison, Davidson, and related soils. It is associated with the well-drained Congaree soils and the poorly drained Wehadkee soils.

The surface soil is brown and friable, but the lower layers are mottled because of insufficient drainage and aeration. The soil is fairly extensive and has characteristics favorable for agriculture. Corn, hay, and pasture are particularly well suited. The larger areas are along the Chattahoochee River.

Profile in a cultivated area:

Surface soil—

0 to 12 inches, brown friable silt loam; weak fine crumb structure.

Subsoil—

12 to 20 inches, light-brown friable silt loam; gray and reddish-brown, distinct, medium mottles are common; moderate fine crumb structure.

20 to 34 inches, brown friable silt loam; gray and red dish-brown medium mottles in moderate number; weak fine crumb structure.

Underlying material—

34 inches +, mottled friable alluvial material consisting of sand, silt, and clay.

The profile layers vary somewhat in texture and thickness. Small mica flakes occur throughout the profile and are abundant in some areas. In many places the soil is too shallow above the water table to allow crop growth. This water table, however, has not changed the color characteristics of the profile.

The fertility of this soil is very high. Runoff is very slow, and internal drainage is slow. Permeabil-

ity is moderate in the surface soil and slow in the subsoil. The soil has a very high moisture-holding capacity. It retains plant nutrients well.

Use and management (Group A–6).—Much of this soil is used for crops and pasture. Some is in forest that consists of alders and willows and a few pines and gums. In areas where the water table is high the soil is idle much of the time. Corn is the chief crop grown on Chewacla silt loam. The yields are fair to good, especially where moderate to heavy applications of suitable fertilizer are used. Corn is sometimes damaged by excess moisture from heavy rains.

Because of its tendency to remain wet, this soil is particularly suitable for plants grown late in summer and early in fall, especially pasture plants. It is easy to work, but the range of moisture content optimum for cultivation is not so wide as for sandy soils on uplands. The soil responds well to fertilization. It is well suited to corn, rye, grasses, lespedeza, cowpeas, soybeans, late vegetables, and such pasture plants as whiteclover, dallisgrass, bermudagrass, and tall fescue.

Chewacla fine sandy loam (0 to 2 percent slopes) (Cn).—This soil has a coarser texture than Chewacla silt loam. The surface soil is brown friable fine sandy loam about 12 inches thick. The subsoil is about 22 inches thick. Its upper part is light-brown, mottled with gray and reddish brown, friable fine sandy loam. Its lower part is brown friable fine sandy loam, mottled with gray and reddish brown. The underlying material is mottled young alluvium. On about 83 acres, this soil has slopes of 6 percent or more.

This soil has high fertility. Runoff and internal drainage are slow. The soil retains plant nutrients well and has a very high capacity for holding moisture.

Use and management (Group A–6).—Chewacla fine sandy loam is about one-third as extensive as Chewacla silt loam. Much of it is used for crops and pasture. Some is in forest that consists mainly of alders and elders but includes a few pines and gums. Corn is the principal crop, and under good management its average yield is relatively high. The soil is easy to work and conserve and responds well to fertilization. Its use suitability is similar to that of Chewacla silt loam.

CONGAREE SERIES

The Congaree soils are brown, mellow, and deep; they occupy nearly level to level first-bottom positions that are only a few feet above the streams. They are well drained but at times are flooded. They are associated with the somewhat poorly drained Chewacla soils and poorly drained Wehadkee soils of the first bottoms. However, because of better drainage and aeration, they show very little mottling.

The Congaree soils generally have a moderate organic-matter content and are medium to strongly acid. Productivity is high, but flooding sometimes adversely affects crop yields. The soils are among the best in the county for corn production.

Congaree fine sandy loam (0 to 2 percent slopes) (Cp).—This soil is characterized by a friable sandy profile that, except for color, shows very little change throughout its entire depth. It is associated with Chewacla and Wehadkee soils of the first bottoms, but it is better drained and usually darker. It has formed from young alluvium made up of materials derived largely from Cecil, Appling, Madison, Davidson, and associated soils. The soil has a fairly large total acreage. The larger areas lie along the Chattahoochee River. This is a useful soil, especially for the production of corn, hay, and pasture.

The profile has the following characteristics:

Surface soil
0 to 13 inches, dark yellowish brown very friable fine sandy loam; weak fine crumb structure.
Subsurface—
13 to 25 inches, yellowish-brown friable fine sandy loam; weak fine crumb structure.
25 to 45 inches, strong-brown very friable fine sandy loam; weak fine granular structure.
Underlying material—
45 inches +, friable alluvial material consisting mainly of sand, silt, and clay.

The thickness and texture of the profile layers vary somewhat from place to place. Many small mica flakes occur throughout the profile.

This soil is high in fertility. It has slow to very slow runoff and medium internal drainage. Some stream erosion may occur during floods, but otherwise there is no erosion hazard. New alluvial material is deposited from time to time by overflow waters. Permeability is moderately rapid in the surface soil and moderate in the subsurface layers. The soil retains plant nutrients well and has a very high moisture-holding capacity.

A few areas of State fine sandy loam, level phase, totaling 83 acres, are included with this soil. In a few places the relief is undulating. This included soil occurs at a little higher elevation than the Congaree and is less subject to overflow. It has formed from moderately young alluvium and is usually deep to bedrock. The soil is well drained, medium to strongly acid, moderate in organic matter, and high in fertility. It is highly retentive of moisture.

The surface layer of this included State soil is brown to dark-brown friable fine sandy loam about 12 inches thick, and the subsoil is dark-brown friable sandy clay loam to fine sandy clay loam about 33 inches thick. The underlying material is moderately young alluvium composed mostly of sand, silt, and clay. This included soil is equal to or a little better than the Congaree soil for the production of corn, hay, and other adapted crops. In general, only a short rotation (corn followed by legumes for hay and green manure) and adequate fertilization will maintain fertility.

Use and management (Group A–5).—Most of Congaree fine sandy loam is cultivated. Some is in pasture and a small part is in forest. Corn is the chief crop, and under good management, including heavy applications of fertilizer, yields are good. The soil is very easy to work and can be cultivated over a wide range of moisture conditions. It is moderately easy to conserve.

This soil is well suited to many crops, among which are corn, grasses, lespedeza, crimson clover, cowpeas, soybeans, potatoes, melons, and late vegetables. It is generally less suitable for wheat, oats, and rye. Wheat tends to bed down and is affected rather severely by rust.

Congaree silt loam (0 to 2 percent slopes) (Cr).—This brown, friable, mellow soil occurs on first bottoms. It is associated with Congaree fine sandy loam and differs principally in having a finer texture.

The surface soil is dark yellowish-brown very friable silt loam, about 18 inches thick. The subsurface layer, about 32 inches thick, is yellowish-brown friable silt loam in the upper part and strong-brown very friable silt loam in the lower part. The structure in the surface soil and subsurface layers is usually weak fine crumb. The material underlying the subsurface layer is brownish friable young alluvium composed largely of sand, silt, and clay.

The fertility of this soil is very high. Runoff is slow to very slow, and internal drainage is medium. Except for possible erosion by overflow water in places, erosion is not a hazard. In some places fresh alluvial material is left after periods of high water. Congaree silt loam is moderately permeable throughout. It has a very high capacity for holding moisture and retains plant nutrients well.

As mapped, this soil includes areas of State silt loam, level phase, totaling about 64 acres. These areas are included because they have a small aggregate area and a use suitability similar to that of the Congaree soil. The included State soil has a surface soil, approximately 12 inches thick, of brown to dark-brown friable silt loam. Its subsoil, about 32 inches thick, is dark-brown friable silty clay loam to silty clay. Underlying the subsoil is fairly young alluvium made up largely of sand, silt, and clay.

Use and management (Group A–5).—Congaree silt loam has a somewhat smaller aggregate area than Congaree fine sandy loam. Most of it is cultivated, but some is in pasture, and a small part is in forest. The chief crop is corn, and under good management, including adequate fertilization, average yields are high.

The soil is highly desirable for agricultural use and is particularly good for corn, hay, and pasture. It is easy to work, but the range of moisture content suitable for tillage is somewhat narrower than for sandy soils on uplands. The soil is very easily conserved. Suitable crops are corn, grasses, lespedeza, crimson clover, soybeans, cowpeas, potatoes, melons, and late vegetables. Less suitable crops are wheat, oats, and rye. Wheat and oats are subject to rust and also bed down to a considerable extent.

DAVIDSON SERIES

The soils of the Davidson series are among the reddest in the county. They occupy upland positions ranging from smooth ridgetops to strong slopes near or adjacent to drainageways. They are deep to very deep and have formed from material weathered from dark-colored basic rock, mainly hornblende schist. For the most part, the relief is rolling and hilly, but in some places it is undulating. Drainage is good to somewhat excessive. The soils are eroded to a moderate degree. In cultivated fields the soil shows very little change in color to plow depth. In places, however, it has a firm consistence derived from the subsoil material brought up by the plow.

The organic-matter content of the soils is fairly low to low. The soils are used mainly for cultivated crops and pasture; their productivity is medium to low.

Davidson clay loam, eroded undulating phase (2 to 6 percent slopes) (Da).—This soil occurs on interstream ridges and slopes leading to or toward drainageways. It is one of the darkest red soils of the uplands. It is related to Mecklenburg and Iredell soils in parent material, but it differs in having a redder, deeper, and better developed profile and better drainage and aeration. It is associated with Cecil and Lloyd soils but is distinguished from them by its darker surface soil and stronger red subsoil. This soil is mainly in the northern part of the county. The aggregate area is very small, but the soil has many good qualities that make it highly useful on some farms.

The profile in a less eroded cultivated area has characteristics as follows:

Surface soil
0 to 7 inches, dark reddish-brown friable to firm clay loam; moderate medium crumb to fine blocky structure.
Subsoil—
7 to 47 inches, dark-red firm clay; moderate medium to fine blocky structure; sticky when wet, hard when dry.
47 to 59 inches, dark-red friable clay loam; moderate fine blocky to weak coarse blocky structure.
Parent material—
59 inches +, partly decomposed dark-colored rock mixed with yellow friable clay loam material.

The surface soil ranges from about 3 to 7 inches in thickness, depending on the degree of erosion. The subsoil ranges from about 50 to 52 inches in total thickness.

This soil has moderate fertility and is medium acid. Runoff is slow to medium, and the erosion hazard is slight to moderate. Internal drainage is medium to slow. Permeability and moisture-holding capacity are moderate.

Areas of Davidson clay loam, undulating phase, (not mapped separately in the county) are included with this soil in mapping. They differ in being uneroded or only slightly eroded and in having a surface soil about 10 inches thick. These areas are included because of small extent and similarity in use and management.

Use and management (Group A–2).—Most of Davidson clay loam, eroded undulating phase, is cultivated. Some is in pasture and a smaller part is in forest. All the common crops are grown. Yields are good, especially where liberal quantities of fertilizer and lime are applied. Workability is good, although the moisture range for satisfactory tillage is relatively narrow and clods tend to form easily if the soil is cultivated when too wet or too dry. The soil can be conserved easily, and it has medium productivity. It responds well to proper fertilization and other good management practices. Many crops are well suited, including corn, cotton, wheat, oats, rye, barley, alfalfa, soybeans, cowpeas, crimson clover, grasses, lespedeza, and potatoes. The soil is also suitable for peach trees.

Davidson clay loam, eroded rolling phase (6 to 10 percent slopes) (Db).—This soil is similar to Davidson clay loam, eroded undulating phase, in profile characteristics, but it has stronger slopes and generally a

slightly thinner subsoil. Most areas occur in the northern part of the county. The total acreage is small, but the soil has good qualities that make it important for agriculture.

The surface soil, about 8 to 7 inches thick, is dark reddish-brown friable to firm clay loam. The texture is somewhat more clayey where subsoil material has been mixed into the plow layer. The subsoil, about 48 to 50 inches thick, is dark-red firm clay. In approximately the lower 12 inches of the subsoil, the material is friable clay loam. Underlying the subsoil is the parent material, which consists of partly decomposed dark-colored rock mixed with yellow friable clay loam.

This soil has moderate fertility and is medium to strongly acid. It has medium to rapid runoff and is moderately to highly susceptible to erosion. Internal drainage is medium to slow. The soil is moderately permeable and holds moisture well.

Severely eroded areas, totaling 5 acres, are included because of small extent. In these areas nearly all or all the surface soil has been washed off, and yields are lower.

Use and management (Group A–1).—Davidson clay loam, eroded rolling phase, is used principally for crops and pasture. A small percentage is forested. Crops common in the county are grown. Yields are good where adequate amounts of fertilizer and lime are applied. The soil has fair workability but tends to clod if worked when too wet or too dry. It can be conserved fairly easily, and its productivity is medium to low. According to local information, cotton matures a little later than on sandy soils and consequently is damaged more frequently by boll weevils.

This soil responds well to fertilizers and other amendments, and its productivity can be built up to a high level. It is particularly suited to small grains—wheat, rye, oats, and barley. Other suitable crops are corn, cotton, alfalfa, soybeans, cowpeas, and grasses.

Davidson clay loam, eroded hilly phase (10 to 15 percent slopes) (De).—This soil is the steepest of the Davidson clay loams; it occupies stronger slopes near drainageways. It is similar to Davidson clay loam, eroded undulating phase, in most characteristics but has much steeper slopes and somewhat thinner profile layers. It has moderate fertility and is medium to strongly acid. Runoff is rapid, and the erosion hazard is high. Internal drainage is medium to slow. Permeability and moisture-holding capacity are moderate.

Some severely eroded areas totaling about 24 acres have been mapped with this soil because of their small extent. Practically none of the surface layer remains. These included areas have low productivity and require careful management to control erosion.

Use and management (Group B–3).—Most of Davidson clay loam, eroded hilly phase, is used for cultivated crops and pasture. Corn, cotton, and hay are the principal crops, but under prevailing management the yields are low. Some improvement in yields can be made by using better soil management. The soil is somewhat difficult to work, and its conservability is only fair. Under proper management it is well suited to pasture, one of its best uses.

GROVER SERIES

The Grover soils occur on uplands. They range from the smooth ridgetops down to the strong slopes near or along drainageways. Relief is dominantly undulating, but it is hilly in some areas, particularly those near drainageways. Drainage is good to excessive. The soils have moderately deep to deep profiles that have developed from residual material weathered from quartz mica schist or from highly micaceous gneiss. They are associated with the Cecil, Appling, and Madison soils. They are similar to the Madison and Louisa soils in parent material but are less red than the Madison, and deeper and less micaceous than the Louisa. Grover soils resemble Appling soils but are generally more shallow, have less depth, and contain a larger quantity of mica flakes. They have a larger mica content than the Cecil soils and are less red. The surface soil of the Grover series has been thinned by erosion.

Grover soils are generally low in organic-matter content and are medium acid. They are used principally for crops and pasture. Productivity ranges from medium to very low.

Grover fine sandy loam, eroded undulating phase (2 to 6 percent slopes) (Ga).—This light-colored, well-drained soil occurs on smooth interstream ridges and mild slopes leading to drainageways. The deep to moderately deep profile gradually gives way to weathered bedrock.

Profile in a cultivated area:

Surface soil—
0 to 6 inches, light olive-brown friable fine sandy loam; very weak fine crumb structure.

Subsoil—
6 to 20 inches, reddish-yellow friable sandy clay loam; moderate medium crumb structure.
20 to 88 inches, brownish-yellow friable sandy clay loam; moderate medium blocky structure.

Parent material—
88 inches +, brownish-yellow partly decomposed micaceous rock.

The surface soil ranges from 3 to 9 inches in thickness. A few reddish-yellow, friable spots of fine sandy clay loam occur where the surface layer has become thin. The subsoil ranges from about 30 to 32 inches in thickness. Mica flakes are conspicuous throughout the profile.

This soil has low fertility. It has slow to medium runoff and is moderately susceptible to erosion. Internal drainage is medium. Permeability is moderately rapid to moderate in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate.

Mapped with this soil is a total of about 54 acres of Grover fine sandy loam, rolling phase. About 42 acres of this included soil are moderately eroded, 10 acres slightly eroded, and 2 acres severely eroded. Some small areas of Madison fine sandy loam, eroded undulating phase, are also included because of their small extent.

Use and management (Group A–3).—Most of the small aggregate area of Grover fine sandy loam, eroded undulating phase, is cultivated. Some is in pasture, and a small part is idle or forested. The principal crops are corn, cotton, and small grains. Under common management, yields are fairly low. Under good

management, including adequate fertilization and suitable rotation of crops, yields can be improved considerably. The soil has very good workability and can be cultivated within a wider range of moisture content than soils having a less sandy surface layer. This soil responds well to proper fertilization and other good management practices. Contour tillage, stripcropping, and terracing are good measures for erosion control.

Grover fine sandy loam, eroded hilly phase (10 to 15 percent slopes) (Gb).—This soil is similar to Grover fine sandy loam, eroded undulating phase, but it has much stronger slopes and has generally thinner subsoil layers. It occupies somewhat broken relief near or adjacent to drainageways and in most places it is poorly suited to tilled crops.

The remaining surface soil, about 3 to 8 inches thick, is light olive-brown friable fine sandy loam. In the thinnest areas, however, the soil is reddish-yellow friable sandy clay loam because some of the subsoil has been mixed into the plow layer during cultivation. The 26- to 28-inch subsoil is reddish-yellow friable sandy clay loam in the upper 10 to 12 inches and brownish-yellow friable sandy clay loam in the lower 16 inches. The subsoil is underlain by friable brownish-yellow, partly decomposed micaceous rock. Mica flakes are present throughout the profile.

The fertility of this soil is low. Runoff is rapid and the erosion hazard is high. Internal drainage is medium, and the moisture-holding capacity is moderate.

Mapped with this soil are areas of Grover fine sandy loam, severely eroded phase, too small to be mapped separately. These areas have lost nearly all or all the surface soil. They cover about 13 acres.

Use and management (Group B–3).—Most of the small aggregate area of this eroded hilly phase is cultivated or idle cropland. Some is in pasture and some in forest. Corn, cotton, and hay are grown but have very low yields under common management. The soil is relatively difficult to work and cannot be easily conserved. Pasture is better suited than cultivated crops. Under proper management, including suitable fertilization and seeding, this soil will provide at least fair grazing.

GULLIED LAND

Gullied land (6 to 15 percent slopes) (Gc).—This miscellaneous land type consists of small widely scattered areas of Cecil and Lockhart soils. These areas have been reduced to an intricate pattern of gullies by severe erosion. Nearly all of the surface soil has been washed away, and many gullies have cut into or through the red clay or clay loam subsoil. Originally, these areas were moderately fertile, but after clearing they were improperly cultivated and subjected to much erosion. Runoff now is rapid to very rapid, and drainage is excessive. The hazard of further erosion is high to extremely high.

Use and management (Group C–1).—About half of this land type has grown up in pine forest. The rest is mainly idle, but some is in pasture of low quality. This land type is very difficult to work and to conserve, and its productivity is very low. In most places it cannot be reclaimed at a reasonable cost. Terraces and diversion ditches would be required, as well as seeding or natural revegetation. This land is unsuitable for crops and pasture because of severe erosion and other unfavorable features. It can be used best for trees.

HELENA SERIES

The Helena series occurs on smooth interstream ridges and gradual upland slopes near or leading to drainageways. It has formed from material weathered from aplitic granite (a fine-grained granite composed principally of quartz and feldspar), which in places is mixed with material derived from basic rock, usually diorite. The Helena soil is associated with Appling soils but differs mainly in having a heavier and more distinctly mottled subsoil. The profile is only moderately deep. Drainage is somewhat poor, largely because the subsoil is slowly permeable. Relief is prevailingly rolling.

The organic-matter content is usually low, and the soil is medium acid. Productivity for crops and pasture is low to very low.

Helena sandy loam, eroded rolling phase (6 to 10 percent slopes) (Hb).—This light-colored, friable soil is characterized by a claypan in the subsoil. Moderate erosion has carried away part of the surface soil. The soil areas are small and are scattered throughout the county.

Profile in a less eroded cultivated area:

Surface soil—
0 to 6 inches, light brownish gray friable sandy loam; very weak fine crumb structure.

Subsoil—
6 to 24 inches (claypan), yellow very firm, tough, heavy sandy clay; brown and red medium mottles common; strong medium to coarse blocky structure; very plastic and sticky when wet; hard when dry.
24 to 32 inches, light gray, firm, heavy sandy clay; many conspicuous yellowish-brown to yellowish-red fine to medium mottles; strong medium to coarse blocky structure; plastic when wet; hard when dry.

Parent material—
32 inches +, light-colored decayed aplitic granite mixed with dark decayed diorite rock.

The remaining surface soil ranges from about 3 to 8 inches in thickness. In areas where the surface layer is thinnest, it is a light yellowish-brown sandy clay loam because clayey subsoil material has been mixed with it during tillage. The subsoil layers vary to a small extent in thickness.

The fertility of this soil is low. Runoff is medium to rapid, and the erosion hazard moderate to high. Internal drainage is slow. Permeability is moderately rapid in the surface soil but slow in the subsoil because of the very firm heavy claypan. The moisture-holding capacity of the soil is moderately low to low.

About 58 acres of the severely eroded rolling phase of Helena sandy loam and about 3 acres of the severely eroded hilly phase (10 to 15 percent slopes) are mapped with this phase. These severely eroded areas have lost more than 75 percent of their surface soil. They are indicated on the soil map by symbol. Inclusions not shown by symbol are small undulating areas

(2 to 6 percent slopes) of Helena sandy loam. Together these inclusions make up about 50 acres that are moderately eroded, 3 acres that are slightly eroded, and 1 acre that is severely eroded. Also included are about 2 acres of the moderately eroded hilly phase. All these inclusions are too small to justify separation on the soil map.

Use and management (Group B–4).—About one-third of the very small aggregate area of Helena sandy loam, eroded rolling phase, is cultivated. The rest is idle, in pasture, and in forest. Corn, wheat, oats, and lespedeza are the chief crops. Average yields are low under common management, but considerable improvement can be expected from good management. The soil has poor workability and conservability. Nevertheless, it is suitable for corn, wheat, oats, rye, grasses, lespedeza, crimson clover, cowpeas, soybeans, sweetpotatoes, and vegetables. This soil occurs in small tracts and can be used and managed like the adjacent larger areas.

HIWASSEE SERIES

The Hiwassee soils are on stream terraces that are comparatively high, apparently very old, and not subject to overflow. These soils have a characteristic dark-red, deep, well-developed profile. They are underlain by old alluvial material of mixed character or by weathered rock material in its original place. The soil is dominantly undulating and rolling, though some of it is hilly. Drainage is good to excessive. The soils have been eroded to such an extent that only about 2 to 8 inches of the original 9- to 10-inch surface soil remains.

The soils of the Hiwassee series have a fair to moderately low supply of organic matter and are medium acid. They are used for crops and pasture. Productivity is medium to low.

Some areas are closely associated with areas of Louisa soil in a Hiwassee-Louisa complex. This complex is medium to strongly acid and has low to very low productivity.

Hiwassee sandy loam, eroded undulating phase (2 to 6 percent slopes) (Hb).—This well-drained soil occurs on high stream terraces, where it has formed over alluvial material that is apparently old. Between 25 and 75 percent of the original surface soil has been lost through erosion since the soil has been under cultivation. Even with the erosion losses, the soil ranks relatively high as cropland. It is associated with Molena and Wickham soils, which occupy lower terraces. It has a darker red profile than the Wickham soil and it is not as sandy as the Molena soil. The areas are generally small and occur near the larger streams of the county.

Profile in a cultivated area:

Surface soil—
0 to 7 inches, dark reddish-brown friable sandy loam; weak medium crumb structure.

Subsoil—
7 to 45 inches, dark-red friable clay loam; moderate medium crumb to fine blocky structure; slightly sticky when wet.
45 to 52 inches, dark-red friable fine sandy clay; moderate medium crumb structure; small gravel in lower part.

Underlying material—
52 inches +, old alluvium of reddish-brown friable fine sandy clay material mixed with gravel; a few yellow and gray distinct medium mottles.

Variations are chiefly in the color and thickness of the surface soil. This layer was originally about 10 inches thick, but erosion has reduced it to about 3 to 8 inches. In the thinnest areas the 5-inch plow layer is composed of a mixture of surface and subsoil material. It is a dark-red heavy sandy loam. The subsoil varies a little in thickness; in places it directly overlies residual rock material.

This soil has moderate fertility. Runoff and internal drainage are medium. Permeability is moderate to moderately rapid in the surface soil and moderate in the subsoil. The soil has moderate moisture-holding capacity and retains applied plant nutrients well.

As mapped this soil includes about 82 acres of undulating Hiwassee sandy loam that is uneroded or only slightly eroded. The surface layer, about 10 inches thick, is dark reddish-brown friable sandy loam. Otherwise the soil is like Hiwassee sandy loam, eroded undulating phase, and the two soils can be used and managed in the same way.

Use and management (Group A–2).—Hiwassee sandy loam, eroded undulating phase, has a very small aggregate area. Nearly three-fourths of the soil is cultivated. The rest is mostly in pasture. The crops grown are corn, oats, wheat, lespedeza, and cotton. Yields are low under common management, but they can be increased under better management. The soil has good workability and conservability and responds satisfactorily to proper fertilization and other suitable practices. Its chief needs are improved fertility and adequate protection from erosion. Besides the crops commonly grown, corn, rye, alfalfa, crimson clover, cowpeas, soybeans, melons, sweetpotatoes, vegetables, and peaches and other fruits are suited to this soil.

Hiwassee sandy loam, eroded rolling phase (6 to 10 percent slopes) (Hc).—This soil has profile characteristics similar to those of the eroded undulating phase, but its slopes are stronger and its subsoil generally is somewhat thinner. The remaining surface soil is dark reddish-brown friable sandy loam about 2 to 7 inches thick. Where tillage has mixed part of the subsoil into the plow layer, the soil is dark-red heavy sandy loam. The subsoil, about 41 to 44 inches thick, is dark-red friable clay loam in the first 34 to 37 inches and dark-red friable fine sandy clay in the lower 7 inches. It is underlain by old alluvial material, or by weathered rock material in its original place.

This soil is moderate in fertility. Runoff is medium to rapid, and the soil is moderately to highly susceptible to further erosion. Internal drainage is medium. Permeability in the surface soil is moderate to moderately rapid; and in the subsoil, moderate. The soil is moderately retentive of moisture and applied plant nutrients.

Mapped with this soil are about 52 acres that have lost all or nearly all the original surface layer through severe erosion, and about 17 acres that are only slightly eroded. These areas are included because of their small total extent.

Use and management (Group A–1).—Most of the

very small aggregate area of Hiwassee sandy loam, eroded rolling phase, is cultivated. Some is in pasture, and a small percentage is idle or in forest. The chief crops are corn, oats, wheat, lespedeza, and cotton. Average yields are fairly low under prevailing management but can be expected to be higher under improved management that includes adequate fertilization. The soil has fair workability. It is relatively difficult to conserve. Appropriate measures for erosion control include contour tillage, stripcropping, and terracing where practicable. About the same crops are suited to this soil as to Hiwassee sandy loam, eroded undulating phase, but more intensive management practices are needed to maintain fertility and control erosion.

Hiwassee-Louisa soils, eroded hilly phases (10 to 15 percent slopes) (Hd).—This is a complex of hilly areas of Hiwassee and Louisa soils on narrow blufflike positions between first bottoms and stream terraces or between stream terraces and uplands. The soils in this complex are too small in area and too intricately associated to be mapped separately. The Hiwassee soil, formed over old alluvial material, is relatively deep; whereas the Louisa, which formed from weathered mica schist that was never moved from its original place, is a shallow soil. In some places there has been an overlapping of Hiwassee soil on micaceous Louisa soil material. Many rounded cobblestones and pebbles are scattered over the surface of this complex.

In the areas of Hiwassee soil, the surface soil remaining after erosion is dark reddish brown friable sandy loam about 2 to 6 inches thick. In areas that have been cultivated, the soil to plow depth is dark-red, friable, heavy sandy loam. The subsoil, about 38 to 41 inches thick, is dark-red friable clay loam for most of its depth, but a dark-red friable fine sandy clay in the lower 6 inches. The subsoil lies on old alluvial material, or on material derived from rock that weathered in place.

In the areas of Louisa soil, the remaining surface soil is brown very friable fine sandy loam about 2 to 4 inches thick. In areas that have been cultivated, subsurface material has been mixed with surface soil during tillage, and, as a result, the plow layer is yellowish-red very friable fine sandy loam. The subsurface layer is yellowish-red very friable fine sandy loam about 17 to 19 inches thick; it overlies soft material weathered from mica schist rock.

Areas of this complex totaling about 94 acres are severely eroded and have lost all or almost all of the surface soil. On 14 acres the complex has slopes greater than 25 percent.

In the areas of this soil complex, runoff is rapid and erosion hazard is high. Internal drainage is medium to rapid. The organic-matter content is fair to low, and fertility is moderate to low. Permeability is moderate in the surface soil and moderate to rapid in the subsoil. The moisture-holding capacity is medium to low.

Use and management (Group C–1).—A large percentage of the very small total area of Hiwassee-Louisa soils, eroded hilly phases, is in second-growth pine forest. The rest is pasture or idle land. This complex has poor to very poor workability, fair to very poor conservability, and low to very low productivity. Strong slopes, erodibility, and other unfavorable features make it unsuitable for crops or pasture and limit its use to forest.

IREDELL SERIES

The Iredell soil occurs mainly on rolling uplands, but some areas are on undulating uplands. It has formed from material weathered from dark basic rock, usually diorite. It ranges from 15 to 18 inches in depth to the underlying parent material. In eroded areas the depth is less.

The soil is low to moderate in organic-matter content and is slightly acid. It is used chiefly for cultivated crops and pasture. Productivity is low to very low.

Iredell stony clay loam, rolling phase (6 to 10 percent slopes) (Ia).—This brown somewhat poorly drained soil occurs on moderately smooth upland ridges and gradual slopes leading to drainageways. It is shallow and has the firmest and heaviest clay subsoil in the county. This subsoil constitutes a claypan that shrinks and cracks when dry and swells when wet. Stones scattered over the surface interfere to some extent with cultivation. The relief on about 38 acres of this soil is undulating (2 to 6 percent slopes).

Profile in a cultivated area:

Surface soil—
0 to 5 inches, dark grayish-brown friable stony clay loam; weak fine crumb structure.

Subsoil—
5 to 12 inches (claypan), light olive-brown, very firm, heavy clay; strong coarse blocky structure; very plastic when wet and very hard when dry.

Parent material—
12 inches +, mingled shades of yellow, olive, gray, and brown friable disintegrated and partly decomposed diorite rock.

Variations occur in the profile. The thickness of the surface soil ranges from 2 to 6 inches, according to the degree of erosion. In cultivated areas where the remaining surface soil is thinnest, the plow layer contains subsoil material and is dark yellowish-brown to olive-brown firm stony clay loam. The profile varies in depth to unweathered rock.

The fertility of this soil is moderate, and tests indicate that the supply of available potassium is generally low. Runoff is medium to rapid, and the erosion hazard is moderate to high. Internal drainage is very slow. The heavy very firm claypan subsoil is very slowly permeable and restricts movement of water through the profile. The soil has a moderate to low capacity for retaining moisture.

Use and management (Group C–1).—Most of the acreage of Iredell stony clay loam, rolling phase, is cultivated or in pasture. Some is idle, and some is forested with pine and hardwoods. Cotton and a few other crops common in the county are grown, but under prevailing management yields are generally very low. Where proper management practices are used, cotton produces good yields. This soil has very poor workability and conservability. The most feasible use is for forest. Where it must be used for crops or pasture, corn, lespedeza, crimson clover, vetch, cowpeas, soybeans, and pasture grasses can be grown if management practices are suitable.

LLOYD SERIES

The Lloyd soils comprise a relatively large red-land group. They are in upland positions ranging from smooth interstream ridges to very strong slopes along drainageways. Relief is commonly rolling and hilly, but it is undulating in some areas and steep in others. Drainage is good to excessive. The soils have a deep to moderately deep profile that has formed through the decay of a mixture of basic rocks and granite, gneiss, or mica schist. Where they occur separately, the basic rocks of this mixture are the kinds that give rise to Davidson soils, and the acidic rocks (granite, gneiss, and mica schist) are the kinds that give rise to Cecil soils. The Lloyd series shows the influence of the mixed parent rocks. They closely resemble soils of the Cecil series in some characteristics and the Davidson soils in others. Their profile characteristics are intermediate between those of the Cecil and Davidson soils.

The Lloyd soils are moderate to low in organic-matter content and medium to strongly acid. They are in forest, are cultivated, or are used for pasture. Their productivity for crops and pasture ranges from medium to very low.

Lloyd sandy loam, eroded undulating phase (2 to 6 percent slopes) (Le).—This well-drained soil occupies smooth interstream ridgetops and mild slopes leading to drainageways. It is characterized by a reddish-brown friable sandy loam surface soil and a red, well-developed, firm clay subsoil.

This soil is related to Cecil, Davidson, and Madison soils but is somewhat darker than the Cecil, sandier and lighter colored than the Davidson, and less micaceous and finer textured in the subsoil than the Madison. It is one of the best upland soils for crops. Erosion, however, has been active and has reduced the surface soil to a thickness of about 3 to 9 inches. The relatively small acreage is scattered throughout the county.

Profile in a less eroded cultivated area:

Surface soil—
0 to 8 inches, reddish-brown friable sandy loam; weak fine crumb structure.
Subsoil—
8 to 40 inches, red firm clay loam; weak medium blocky structure.
Parent material—
40 inches +, reddish-brown material from decomposed basic rock and granite, gneiss, or mica schist.

The color of the profile is affected by the quantity of residual basic rock in the parent material. Where the quantity is relatively small, the color approaches that of the Cecil profile; where it is relatively large, the color is nearly that of the Davidson profile. The subsoil ranges from about 30 to 32 inches in thickness.

The fertility of this soil is moderate. The organic-matter content is generally moderate, but in the more eroded areas it is low. Runoff and internal drainage are medium. The erosion hazard is slight to moderate. Permeability is moderately rapid to moderate in the surface soil and moderate in the subsoil. The water-holding capacity is moderate.

Included with this phase, as mapped, are areas of the following three soils: Lloyd sandy loam, undulating phase, totaling about 32 acres; Lloyd clay loam, undulating phase, about 7 acres; and Lloyd clay loam, eroded undulating phase, about 189 acres. The sandy loam inclusion differs from this phase mainly in being uneroded or only slightly eroded and in having a reddish-brown friable surface soil about 11 inches thick. The other two inclusions differ in having clay loam surface soils, somewhat darker profiles, and parent materials that contain a larger quantity of weathered basic rock. All these soils are included because of small extent and generally similar management requirements. Also mapped with Lloyd sandy loam, eroded undulating phase, are small severely eroded areas, totaling about 39 acres, that have lost more than 75 percent of the surface soil. In cultivated areas of this inclusion, the plow layer consists of a mixture of the remaining surface soil and subsoil material and is a red to reddish brown friable clay loam. These severely eroded areas are shown on the soil map by symbol.

Use and management (Group A–2).—Most of Lloyd sandy loam, eroded undulating phase, is cultivated, but some is in pasture. Small percentages are idle or in forest. Crops common in the county are grown. Variations of a corn-cotton-small grain-hay rotation are used by farmers getting the best yields. Where good management, including proper fertilization, is practiced, yields usually are medium to fairly high. The soil is easy to work. The moisture range suitable for cultivation, however, is somewhat narrower for this soil than for sandy Cecil soils. Nevertheless, the range is broader than for Davidson soils.

The soil is easily conserved, and it responds well to fertilization and other good management practices. Because of the smooth surface relief, the soil can be used in relatively short rotations and can be protected against erosion by simple methods. It is well suited to many kinds of crops, including corn, cotton, wheat, oats, rye, barley, alfalfa, crimson clover, lespedeza, soybeans, cowpeas, grasses, potatoes, and vegetables.

Lloyd sandy loam, rolling phase (6 to 10 percent slopes) (Lf).—This soil consists of well-drained to somewhat excessively drained areas on interstream ridges and on gradual slopes toward drainageways. The soil is not extensive. Erosion has affected it very little, if at all. The profile is relatively deep. The 9-inch surface soil is reddish-brown friable sandy loam. The 31-inch subsoil is red firm clay loam. The parent material varies in thickness and is a reddish-brown mixture derived from partly decayed basic and acidic rocks. Runoff is medium to rapid; erosion hazard is moderate to high. Internal drainage is medium.

Areas of Lloyd clay loam, rolling phase, totaling about 69 acres are mapped with this soil. The included soil differs in having a clay loam texture, a somewhat darker color, and a larger content of weathered basic rock in the parent material. The range of moisture content suitable for cultivation is narrow because the plow layer is a heavy clay loam.

Use and management (Group A 1).—Most of Lloyd sandy loam, rolling phase, is cultivated. Some is in pasture, and a small percentage is idle or in pine-and-hardwood forest. Under prevailing management yields are fairly low, but under good management that includes adequate fertilization, they can be improved. Many crops are well suited, including corn, cotton, wheat, oats, rye, barley, alfalfa, crimson clover, lespedeza, soybeans, cowpeas, grasses, and vegetables. The

soil is fairly easy to work and conserve. However, intensive methods of erosion control are needed. Crop rotations should be relatively long, and close-growing crops should occupy the land as much of the time as possible.

Lloyd sandy loam, eroded rolling phase (6 to 10 percent slopes) (Lg).—This phase has lost 25 to 75 percent of its surface soil through erosion. Except for the erosion losses, it is similar to the uneroded rolling phase. The remaining surface soil, about 3 to 8 inches thick, is reddish-brown friable sandy loam. In the thinner areas the plow layer is a mixture of surface soil and subsoil material and, as a result, is more clayey and less friable than in areas less eroded. The subsoil is red firm clay loam about 29 to 31 inches thick. It overlies a reddish-brown mixture of partly decomposed basic and acidic rocks. The soil has medium to rapid runoff and is moderately to highly susceptible to erosion. Internal drainage is medium.

Mapped with this soil is a total of about 672 acres of Lloyd clay loam, eroded rolling phase. The included soil differs principally in having a clay loam surface soil, a somewhat darker color, and a larger quantity of decomposed basic rock in its parent material. Largely because of its clay loam texture, the soil has a relatively narrow range of moisture content suitable for cultivation.

Use and management (Group A–1).—About half of Lloyd sandy loam, eroded rolling phase, is in cultivation and a third is in pasture. The rest is about equally divided between idle land and forest that is mainly pine. The common crops are grown. Yields are relatively low under prevailing management, but they can be increased by improved methods, among which are suitable rotation of crops and proper fertilization. The soil has good workability and fair conservability. Its use suitability and management requirements are similar to those of Lloyd sandy loam, eroded undulating phase. Because of its stronger slope, however, the soil has greater erosion control problems and needs longer rotations that include close-growing crops for longer periods. To control erosion and maintain fertility, farmers are terracing, stripcropping, contour plowing, using long rotations, and applying fertilizer in adequate amounts.

Lloyd sandy loam, hilly phase (10 to 15 percent slopes) (Lh).—This somewhat excessively drained soil occurs mainly on strong slopes near drainageways. Its profile is similar to that of Lloyd sandy loam, rolling phase, but its slopes are stronger and its surface soil and subsoil are generally thinner.

The 9-inch surface soil is reddish-brown friable sandy loam; the 30-inch subsoil is a red firm clay loam. The parent material varies in thickness and is a reddish-brown mixture of partly decomposed basic and acidic rocks. Runoff on this soil is rapid, and in cleared areas the erosion hazard is high. Internal drainage is medium. The aggregate area of this soil is very small.

Mapped with this phase are about 73 acres of Lloyd clay loam, hilly phase. This inclusion differs mainly in having a heavier, somewhat darker surface soil and in having more of the decomposed basic rock in the parent material.

Use and management (Group B–3).—A large percentage of Lloyd sandy loam, hilly phase, is forested with mixed pines and hardwoods. Some is in pasture, and a small part is cultivated. Strong slopes, erosion hazard, and poor workability make this phase better suited to pasture and close-growing crops than to clean-cultivated crops. Where the soil must be cultivated, management should include use of rotations, provide a maximum of close-growing crops, terracing where feasible, stripcropping, contour plowing, and proper fertilization. These practices will help protect the soil against erosion and do much to maintain its fertility.

Lloyd sandy loam, eroded hilly phase (10 to 15 percent slopes) (Lk).—This soil consists of former areas of Lloyd sandy loam, hilly phase, that have been moderately eroded and therefore have lost 25 to 75 percent of the surface layer. The remaining surface soil is reddish-brown friable sandy loam about 2 to 7 inches thick. In the thinner cultivated areas, red subsoil material has been mixed with remnants of the surface layer, and as a result the plow layer is somewhat heavier by reason of the additional clay. The subsoil and parent material are similar to corresponding parts of the uneroded hilly phase.

Runoff is rapid, and the hazard of additional erosion is high. Internal drainage is medium. The soil has a fairly large total area.

Areas totaling about 194 acres of Lloyd clay loam, eroded hilly phase, are included with this soil because of the small acreage. The included soil differs mainly in having a heavier and somewhat darker surface layer and a larger proportion of decomposed basic rock in the parent material.

Use and management (Group B–3).—Lloyd sandy loam, eroded hilly phase, is mainly in crops and pasture, but some areas are forested and others are idle. It is fairly well suited to pasture, but strong slopes and erodibility make it poor or very poor for tilled crops. Productivity for crops and pasture is low to very low. Management requirements for erosion control and maintenance of fertility are the same as for Lloyd sandy loam, hilly phase.

Lloyd sandy loam, steep phase (15 to 25 percent slopes) (Lm).—This somewhat excessively drained to excessively drained soil occupies breaks or very strong slopes adjacent to drainageways. It is similar to Lloyd sandy loam, hilly phase. It differs mainly in having stronger slopes and a slightly thinner surface soil and subsoil. The reddish-brown friable surface soil is about 8 inches thick, and the red firm clay loam subsoil about 28. The parent material, a mixture of partly decomposed basic and acidic rocks, varies somewhat in thickness. This soil has rapid to very rapid runoff and high to very high erosion hazard. Internal drainage is medium.

About 9 acres mapped with this soil are severely eroded and have lost practically all or all of the surface soil. In about 15 acres the slopes are very steep, or more than 25 percent in gradient.

Use and management (Group C–1).—About 90 percent of the relatively small acreage of Lloyd sandy loam, steep phase, is forested with pines and hardwoods. The rest is pastured or lies idle. The soil has poor to very poor workability, fair to poor conservability, and very low productivity. The steep slopes

make the soil highly susceptible to erosion when cleared and difficult to manage for crops and pasture. It therefore is best used for trees.

Lloyd clay loam, severely eroded rolling phase (6 to 10 percent slopes) (La).—This somewhat excessively drained soil occurs on fairly smooth interstream ridges and gradual slopes leading toward drainageways. Most or all of the areas were originally Lloyd sandy loam, and all or nearly all of the sandy surface soil has been lost through erosion. The remaining part of the original surface soil has been mixed with upper subsoil material by cultivation, and the plow layer ranges from red to reddish brown.

Profile in an idle area once cultivated:

Surface soil—
0 to 5 inches, (plow depth) red to reddish-brown friable clay loam; weak fine crumb to medium blocky structure.
Subsoil
5 to 34 inches, red firm clay loam; weak medium blocky structure.
Parent material—
34 inches +, reddish-brown material from partly decomposed basic rock and granite, gneiss, or mica schist.

The subsoil ranges from about 26 to 29 inches in thickness.

This soil is of moderate fertility and is poorly supplied with organic matter. Runoff is medium to rapid, and the hazard of further erosion is high. Internal drainage is medium. The soil is moderately permeable and has a moderate to moderately low moisture-holding capacity.

Use and management (Group B 1). -Most of the relatively small acreage of Lloyd clay loam, severely eroded rolling phase, is forested with second-growth pines. Some is idle, and a small percentage is in pasture. A few of the common crops are grown on a small part of the soil, but their yields are very low under the management normally practiced. Pasture is generally poor, but with good management it can be improved. This soil is poorly suited to tilled crops because of its unfavorable physical qualities and the hazard of further erosion. It is best suited to deep-rooted perennial legumes or forest.

Lloyd clay loam, severely eroded hilly phase (10 to 15 percent slopes) (Lb).—This excessively drained soil is on strong slopes near or along drainageways. As a result of erosion, very little or none of the original surface soil remains. About one-third of the total acreage was originally Lloyd sandy loam, hilly phase, but the texture has been changed to clay loam by severe sheet erosion. The rest, before erosion, was Lloyd clay loam, hilly phase. Where the soil has been cultivated, the plow layer, mostly subsoil material, is red to reddish-brown friable clay loam. The subsoil and parent material have characteristics similar to those of Lloyd clay loam, severely eroded rolling phase, but the subsoil thickness usually is a little less.

Runoff is rapid and erosion hazard is high to very high. Internal drainage is medium. The soil has a low organic-matter content. It is moderately permeable and moderate to moderately low in moisture-holding capacity.

Use and management (Group C–1).—Most of Lloyd clay loam, severely eroded hilly phase, was once cleared and used for crops and pasture, but the soil is now mainly in second-growth pine forest. A small percentage is idle or in pasture. The soil is very difficult to work and difficult to conserve; it has very low productivity under prevailing management. It is generally unsuitable for crops and pasture because of strong slopes, poor physical qualities, low yields, and high susceptibility to further erosion. Its best use is for forest.

Lloyd clay loam, eroded steep phase (15 to 25 percent slopes) (Lc).—This soil occurs on very strong slopes or breaks adjacent to drainageways. It consists of areas, originally Lloyd sandy loam, that have been moderately to severely eroded. The eroded surface soil, 2 to 6 inches thick, is a reddish-brown friable clay loam. In some places, all of the surface soil has been lost. Where the surface soil is thinnest, it is red clay loam containing a relatively large quantity of subsoil material brought up by tillage. The subsoil, about 25 to 28 inches thick, and the parent material are about the same as in Lloyd sandy loam, steep phase. Runoff is rapid to very rapid, and the erosion hazard is high to very high. Internal drainage is medium.

Use and management (Group C–1).—Most areas of this soil have at some time been used for cultivation or pasture. Nearly all of it is now in forest. The soil is very difficult to work and to conserve. It has very low productivity and is poorly suited to crops and pasture. Its best use is for forest.

Lloyd gravelly sandy loam, eroded steep shallow phase (15 to 25 percent slopes) (Ld).—This excessively drained soil is on broken relief near drainageways. It is distinguished from Lloyd clay loam, eroded steep phase, by its gravelly sandy surface soil and shallow profile. The reddish-brown gravelly sandy loam surface soil has been so eroded that only about 2 to 6 inches remains. The red clay loam subsoil is only about 11 to 14 inches thick, whereas the subsoil of Lloyd clay loam, eroded steep phase, is 25- to 28-inches thick. Both soils have similar parent material.

Profile in a less eroded area:

Surface soil—
0 to 6 inches, reddish-brown very friable sandy loam; weak fine crumb structure; small angular rock fragments make up about 20 percent of the soil mass.
Subsoil—
6 to 20 inches, red firm clay loam; weak medium blocky structure.
Parent material—
20 inches +, reddish-brown mixed, partly decomposed basic and acidic rocks.

The fertility of this soil is low. Its organic-matter content is moderate in the less eroded areas and relatively low in the more eroded areas. This gravelly soil has rapid to very rapid runoff, and the erosion hazard is high to very high. Internal drainage is medium. Permeability of the surface soil is moderately rapid, and that of the subsoil is moderate to moderately rapid. The moisture-holding capacity is low.

Slope and degree of erosion vary considerably. The relief is predominantly steep, but about 21 acres are hilly (10 to 15 percent slopes), and about 47 acres are very steep (more than 25 percent slope). Erosion on most of the steep areas is slight to moderate, but on about 81 acres it is severe. In the hilly areas, about

9 acres are severely eroded and the rest are slightly to moderately eroded. The very steep areas are generally only slightly eroded, because they have remained for the most part in forest.

Use and management (Group C–1).—The small acreage of Lloyd gravelly sandy loam, eroded steep shallow phase, is mostly in second-growth pine forest. Small percentages are in pasture, are idle, or are in crops. The soil has very poor workability and conservability and very low productivity. Because of the steep slopes, shallow profile, erodibility, and low fertility, this soil is best used for forest.

LOCKHART SERIES

The Lockhart soils are on uplands. They range from the smooth interstream divides down to the very strong slopes leading to drainageways. The relief is generally rolling and hilly, but in places is undulating or steep. Drainage is good to excessive. The soils have formed deep profiles in residual material weathered from porphyritic granite, that is, a granite that has unusually large crystals of feldspar or quartz.

Lockhart soils are closely associated with Cecil soils. Because it was not practical to separate the small areas of the Lockhart soils from the Cecil, soils of the two series were mapped as Lockhart-Cecil complexes. The Lockhart soils are very much like the Cecil in most physical characteristics. They differ, however, in having a more friable subsoil, a large number of feldspar and quartz particles, and textural characteristics in the parent material caused by the coarse texture of the parent rock. In addition, they generally have shallower profiles than the Cecil soils and are more susceptible to erosion, especially to gullying. Fairly deep gullies reach into the soft, friable, coarse-textured soil material below the subsoil.

In these complexes the organic-matter content is usually low, and reaction is medium to strongly acid. Productivity for crops and pasture is medium to very low.

Lockhart-Cecil sandy loams, eroded undulating phases (2 to 6 percent slopes) (Lr).—This complex of well-drained Lockhart and Cecil soils occurs in the southern part of the county, where it occupies smooth interstream divides and gentle slopes leading to drainageways. The soils have formed mainly from materials weathered from porphyritic granite, gneiss, or mica schist. They are moderately eroded, and about 25 to 75 percent of the surface soil has been removed.

Profile of Lockhart sandy loam, eroded undulating phase, in a less eroded cultivated area:

Surface soil—
- 0 to 7 inches, yellowish-brown friable sandy loam; weak fine crumb structure

Subsoil—
- 7 to 18 inches, red firm clay loam; weak medium blocky structure.
- 18 to 32 inches, red firm clay loam; weak fine blocky structure; many small mica flakes.

Parent material—
- 32 to 50 inches, red friable clay loam; moderate number of light-red, faint, coarse mottles; very weak fine blocky structure.
- 50 inches +, mixed white and gray decayed granite rock.

The surface soil ranges from 2 to 7 inches in thickness, and the subsoil from 22 to 25. In cultivated fields the color and texture of the plow layer vary according to the quantity of subsoil material mixed in by tillage. In cultivated areas the soil to plow depth ranges from yellowish-brown friable sandy loam to reddish-brown clay loam.

The areas of Cecil soil in this complex have a surface soil of grayish-yellow friable sandy loam about 2 to 6 inches thick. However, the plow layer in the thinner cultivated areas is reddish-brown or brownish-red heavy sandy loam to clay loam because subsoil material has been mixed into it. The subsoil, about 25 to 27 inches thick, is red firm clay of moderate medium blocky structure. It has a moderate quantity of mica flakes in the lower part. The parent material is red friable clay coarsely mottled with brownish yellow. It contains decomposed fragments of gneiss or mica schist, and, in places mica flakes.

The fertility of the soils of this complex is generally low. Runoff is slow to medium, and the erosion hazard is moderate. Internal drainage is medium. Permeability in the surface soil is moderately rapid to moderate, and in the subsoil, moderate. The moisture-holding capacity is moderate. The soils retain applied plant nutrients well.

A few areas, not large enough to be shown separately, are mapped with this complex. These total about 49 acres of soils that are only slightly eroded, and about 29 acres of soils so severely eroded they have lost nearly all or all the surface layer.

Use and management (Group A–2).—Most of the small total area of Lockhart-Cecil sandy loams, eroded undulating phases, is cultivated. The rest of the acreage is pastured, idle, or forested. Cotton, corn, small grains, and hay are the principal crops, and under prevailing management yields are moderately low. Under improved management, including suitable rotations and proper fertilization, higher yields can be obtained, erosion checked, and fertility built up and maintained. The soils of this complex are comparatively easy to work, and their slopes are favorable for the use of the heavier types of farm equipment. Conservability is good, and erosion can be controlled by close-growing crops or by simple engineering practices. Many crops are well suited, including corn, cotton, wheat, oats, rye, crimson clover, lespedeza, soybeans, cowpeas, alfalfa, sweetpotatoes, potatoes, and garden vegetables.

Lockhart-Cecil sandy loams, eroded rolling phases (6 to 10 percent slopes) (Ls).—This complex differs from Lockhart-Cecil sandy loams, eroded undulating phases, principally in having stronger slopes and somewhat thinner surface soil and subsoil layers. The surface soil that remains is about 2 to 6 inches thick. In the cultivated areas that are less eroded, it is yellowish-brown or grayish-yellow to reddish-brown friable sandy loam. In the areas more eroded, where subsoil material has been brought up by the plow and mixed with the sandy surface material, it is reddish-brown to red friable clay loam. In color, texture, and consistence the subsoil and parent material are similar to the corresponding layers in Lockhart-Cecil sandy loams, eroded undulating phases. Runoff is medium to high and erosion hazard is moderate to high. Internal

drainage is medium, and the moisture-holding capacity is moderate.

This complex is in the southern part of the county and is of local agricultural importance. Mapped with it are about 102 acres of Lockhart-Cecil clay loams, eroded rolling phases, that differ principally in having a generally heavier surface soil.

Use and management (Group A–1).—More than half of the fairly large total area of Lockhart-Cecil sandy loams, eroded rolling phases, is cultivated. The rest is mainly in pasture, but some is idle and some is in pine forest. The principal crops are cotton, corn, small grains, and hay. Under improved management the yields of corn can be tripled over those obtained under the practices commonly used, and the yields of cotton can be more than doubled. Many farmers plant row crops year after year, but the farmers getting the best results use variations of the corn-cotton-small grain-hay crop rotation.

The soils of this complex are fairly easy to work but are relatively difficult to conserve. The principal management problems are the control of erosion and maintenance of fertility. Helpful erosion-control measures are terracing, stripcropping, contour plowing, and use of long rotations. The soils respond well to commercial fertilizer and other soil amendments. Crops similar to those on the eroded undulating phases can be grown.

Lockhart-Cecil sandy loams, hilly phases (10 to 15 percent slopes) (Lh).—The strong slopes and erosion hazard make this complex of hilly phases largely unsuitable for tilled crops.

In the Lockhart soil, the surface soil is yellowish-brown friable sandy loam about 6 inches thick. The subsoil, about 23 inches thick, is red firm clay containing small mica flakes. The parent material, variable in thickness, is red, mottled with light-red, friable clay loam. It grades into white to gray disintegrated granite.

In the Cecil soil, the surface soil is about 9 inches thick. It is grayish-yellow friable sandy loam in the approximate first 6 inches and yellowish-red friable heavy sandy loam in the lower 3 inches. The subsoil, about 25 inches thick, is red firm clay that contains a moderate quantity of mica flakes in lower part. The parent material, variable in thickness, is red (splotched brownish-yellow) friable clay mixed with decaying fragments of gneiss or mica schist. This material contains mica flakes.

In forested areas a 2-inch layer of oak leaves, twigs, and leaf mold lies on the surface of both soils of this complex.

The fertility of these soils is low. Runoff is rapid, and the erosion hazard is great. Internal drainage is medium. The soils hold moisture well. Their surface soil is easily permeable, and their subsoil is moderately permeable.

Use and management (Group B–3).—A large percentage of the small total area of Lockhart-Cecil sandy loams, hilly phases, is in forest. The rest is in crops and in pasture. Corn and cotton are the chief crops, and under prevailing management yields are very low. This complex has poor workability, and the strong slopes make the use of machinery difficult. Conservability is fair. Because of unfavorable characteristics, the complex is poorly suited to cultivated crops. It is, however, fairly well suited to pasture.

Lockhart-Cecil sandy loams, eroded hilly phases (10 to 15 percent slopes) (Lu).—This somewhat excessively drained complex occupies strong slopes near or adjacent to drainageways in the southern part of the county. It resembles Lockhart-Cecil sandy loams, hilly phases, in all profile characteristics but differs in degree of erosion, which generally is moderate. The remaining surface soil is about 2 to 6 inches thick. In the less eroded areas, it is yellowish-brown, grayish-yellow, or reddish-brown friable sandy loam. In the more eroded areas where subsoil material has been mixed in by tillage, it is reddish-brown heavy sandy loam or a reddish-brown or red friable clay loam. The rest of the profile is similar to that of Lockhart-Cecil sandy loams, hilly phases.

The fertility of this complex is low. Runoff is rapid and the erosion hazard is high. Internal drainage is medium. The moisture-holding capacity is moderate. Permeability is moderately rapid to moderate in the surface soil and moderate in the subsoil.

Use and management (Group B–3).—Less than a third of this soil is cultivated. A larger part is in second-growth pine. Some of the acreage is idle and some is in pasture. Corn and cotton and a few other crops are grown, but yields are very low under prevailing management. This complex is better suited to pasture than to cultivated crops; it will produce fairly good pasture of sericia lespedeza under proper management.

Lockhart-Cecil sandy loams, steep phases (15 to 25 percent slopes) (Lv).—This complex of somewhat excessively to excessively drained Lockhart and Cecil soils occurs on short very strong slopes adjacent to drainageways. The soils have stronger slopes and thinner profile layers than those in the complex of Lockhart-Cecil sandy loams, hilly phases, but they are otherwise similar.

The fertility of this complex is low. Runoff is rapid to very rapid, and the erosion hazard is high to very high. The moisture-holding capacity is moderate. Permeability is moderately rapid in the surface soil and moderate in the subsoil.

Included with this complex because of similar use suitability is a total of about 527 acres of Lockhart-Cecil clay loams, steep phases. This inclusion differs principally in having a relatively heavy surface soil.

Use and management (Group C–1).—About 90 percent of Lockhart-Cecil sandy loams, steep phases, is in pine-and-hardwood forest. The rest is in pasture or idle. These soils have poor to very poor workability and conservability and very low productivity. Their steep slopes and other unfavorable characteristics render them largely unsuitable for crops and pasture. Forest is their most feasible use.

Lockhart-Cecil sandy loams, eroded steep phases (15 to 25 percent slopes) (Lw).—This complex is made up of eroded areas of Lockhart-Cecil sandy loams, steep phases, that have lost 25 to 75 percent of the surface soil. The remaining surface soil is about 2 to 4 inches thick. In the areas least eroded, it is yellowish-brown or grayish-yellow friable sandy loam. In the areas more eroded, where subsoil material has been mixed

in the plow layer by tillage, the surface soil is reddish-brown friable heavy sandy loam or clay loam. The subsoil is similar to that of Lockhart-Cecil sandy loams, hilly phases, but is not so thick. The parent material, variable in thickness, is similar to that in the complex of hilly phases.

The fertility of this complex is low. Runoff on the steep slopes is rapid to very rapid, and the soils are very susceptible to further erosion. Internal drainage is medium. The moisture-holding capacity is moderate. Permeability is moderately rapid to moderate in the surface soil and moderate in the subsoil.

Included with this complex, as mapped, is a total of about 111 acres of Lockhart-Cecil clay loams, eroded steep phases. This inclusion differs mainly in having somewhat heavier surface soil; it has similar use suitability.

Use and management (Group C–1).—This complex is largely in second-growth pine forest. Some of the acreage is in pasture, idle, or in crops. These soils are very difficult to work and to conserve and have very low productivity. Their use is restricted to forest because of their steep slopes, susceptibility to erosion, low fertility, and other unfavorable characteristics.

Lockhart-Cecil clay loams, severely eroded rolling phases (6 to 10 percent slopes) (Ln).—Severely eroded clay loam soils on fairly smooth interstream divides and moderate slopes toward drainageways make up this complex. The individual Lockhart and Cecil areas are so small and so intricately associated that it is not feasible to separate them on the soil map. Severe erosion makes this complex unsuitable for cultivation.

Profile in a cultivated area:

Surface soil—
0 to 5 inches (plow layer), red to reddish-brown friable clay loam; weak fine crumb to medium blocky structure.

Subsoil—
5 to 15 inches, red firm clay loam; weak medium blocky structure.
15 to 26 inches, red firm clay loam; weak fine blocky structure; a large number of mica flakes.

Parent material—
26 to 42 inches, red friable clay loam; light-red faintly defined coarse mottles in moderate numbers; very weak fine blocky structure.
42 inches +, mixed white and gray decayed granite rock.

The subsoil ranges from about 19 to 21 inches in thickness.

The plow layer in the Cecil areas is red to reddish-brown friable clay loam, mainly subsoil material turned up by tillage. The subsoil is red, firm, heavy clay, 21 to 24 inches thick. It has a moderate medium blocky structure and in the lower part contains a moderate quantity of mica flakes. The parent material is red friable clay splotched with brownish yellow. It contains soft decayed fragments of gneiss or mica schist. In places it contains mica flakes.

This complex of soils has low fertility and moderate permeability and moisture-holding capacity. Runoff is medium to rapid, and the hazard of further erosion is moderate to high. Internal drainage is medium.

Use and management (Group B–1).—Small percentages of this complex are in cultivation and in pasture. The largest part is in second-growth pines and in idle areas. This complex has poor workability, only fair conservability, and low to very low productivity. It is poorly suited to crops, largely because it has a narrow range of moisture content suitable for tillage, has low fertility, and needs intensive management for erosion control. If heavily fertilized and properly seeded, it is fairly well suited to pasture, but a satisfactory stand of desirable plants is hard to maintain.

Lockhart-Cecil clay loams, severely eroded hilly phases (10 to 15 percent slopes) (Lo).—This complex of somewhat excessively drained Lockhart and Cecil soils occupies strong slopes near or along drainageways. It is composed of areas, originally Lockhart-Cecil sandy loams, hilly phases, that have lost nearly all or all of the surface soil through erosion. The plow layer in cultivated areas consists principally of subsoil material brought up by the plow and is red to reddish-brown friable clay loam. The subsoil is red firm clay loam to red, firm, heavy clay about 18 to 22 inches thick. The parent material varies in thickness and consists of red friable clay loam or clay, mottled with light red or brownish yellow. It contains or grades into weathered rock material.

The fertility of this complex is low. Runoff is rapid, and the erosion hazard is high. Internal drainage is medium. The soils are moderately permeable and have moderate moisture-holding capacity.

Use and management (Group C–1).—The fairly large aggregate area of Lockhart-Cecil clay loams, severely eroded hilly phases, is largely in second-growth pine forest or in areas left idle. Some, however, is in crops and in pasture. This complex is difficult to work and difficult to conserve and has low productivity. Because of its characteristics unfavorable for crops and pasture, use is restricted almost wholly to forest.

Lockhart-Cecil clay loams, severely eroded steep phases (15 to 25 percent slopes) (Lp).—This somewhat excessively drained to excessively drained complex occupies breaks or short, very steep slopes adjacent to drainageways. It consists of areas that were originally Lockhart-Cecil sandy loams, steep phases. These areas have been eroded so severely that little or none of the original surface soil remains. Where the soils of this complex have been cultivated, the surface layer is red friable clay loam to plow depth and in nearly all places it is composed of subsoil material. The subsoil, about 17 to 21 inches thick, varies from red firm clay loam to red, firm, heavy clay. The parent material, varying from place to place in thickness, is red friable clay loam mottled with light red, or it is red friable clay mottled with brownish yellow. It contains or grades into decayed parent rock material.

Runoff is rapid to very rapid, and the erosion hazard is high to very high. Permeability and moisture-holding capacity are moderate.

Use and management (Group C–1).—This complex has a small total area. It is mainly in second-growth pine forest. Some, however, is in pasture and some is idle. Workability and conservability are very poor, and productivity is very low. Steep slopes, severe erosion, and low fertility make the soils of this complex unsuitable for crops and pasture. Their best use is for forest.

LOUISA SERIES

The Louisa soils characteristically are on very strong to strong upland slopes, but some areas occupy smooth narrow ridgetops. Drainage generally is somewhat excessive to excessive, although it is good in some places. The soils have formed through the decay of mica schist or quartz mica schist. Mica flakes are present throughout the entire profile, which is only moderately deep to the weathered rock. The Louisa soils are closely related to Madison soils in parent material but, in contrast, occupy steep choppy relief for the most part and nearly everywhere are shallower and have no true subsoil development.

The organic-matter content is usually low, and the soils are medium to strongly acid. Productivity for crops and pasture is low to very low.

Louisa fine sandy loam, steep phase (15 to 25 percent slopes) (Lxb).—This somewhat excessively to excessively drained soil is located on very strong upland slopes descending from narrow ridgetops. It is associated with Madison and Cecil soils. The fairly large acreage occurs along the Chattahoochee River and other larger streams. The soil has little agricultural value.

Profile in a forested area:

Surface soil—
0 to 5 inches, brown very friable fine sandy loam; very weak fine crumb structure; considerable number of fine mica flakes; layer has a covering of forest litter and leaf mold about 1½ inches thick.

Subsurface—
5 to 24 inches, yellowish-red, soft, very friable fine sandy loam; weak fine crumb structure; large quantity of mica flakes.

Parent material—
24 inches +, yellowish-red, soft, decayed mica schist rock.

Except for the first inch or two in forested areas, the soil is poorly supplied with organic matter. It is low in fertility. Runoff is rapid to very rapid. The erosion hazard is great to very great. Internal drainage is medium to rapid. Permeability is moderate in the surface soil and moderately rapid in the subsurface layer. The moisture-holding capacity is low to very low.

Areas of very steep soil (slopes greater than 25 percent), totaling about 200 acres, are included because they are small in extent and have a use suitability similar to that of the steep phase.

Use and management (Group C–1).—About 90 percent of Louisa fine sandy loam, steep phase, is in pine-hardwood forest; the rest is in pasture or idle. The soil is very difficult to work and to conserve, and its productivity is very low. Consequently, it is poorly suited to crops and pasture and is best used for forest.

Louisa fine sandy loam, eroded steep phase (15 to 25 percent slopes) (Lxc).—This soil consists of steep areas of Louisa fine sandy loam that have lost 25 to 75 percent of the original surface soil through erosion. The remaining surface soil is only about 1 to 3 inches thick. The subsurface material has been mixed with the surface layers in areas that were once cultivated. The mixture is a brown to reddish-brown very friable micaceous fine sandy loam. The subsurface layer, 15 to 17 inches thick, is yellowish-red very friable, soft, micaceous fine sandy loam. The parent material varies in thickness and is composed of soft decomposed mica schist.

This eroded soil has rapid to very rapid runoff and is very susceptible to erosion. Internal drainage is medium to rapid.

Severely eroded areas totaling about 398 acres are mapped with this phase. These areas have lost most of their surface soil. They are included because they are relatively small and have essentially the same use suitability as the eroded steep phase.

Use and management (Group C–1).—Louisa fine sandy loam, eroded steep phase, is mainly in second-growth pines, but a small part is in pasture or idle. The soil has very poor workability and conservability and very low productivity for crops and pasture; it is best suited to forest.

Louisa fine sandy loam, eroded hilly phase (10 to 15 percent slopes) (Lxa).—This soil occupies strong slopes descending from narrow ridge crests. It is similar to Louisa fine sandy loam, steep phase, except for slightly thicker profile layers, less steep slopes, and moderate erosion. The remaining surface soil is about 2 to 4 inches thick. It is brown very friable micaceous fine sandy loam. Where subsurface material is mixed with surface soil in areas once cultivated, the soil is reddish brown to plow depth. The subsurface, about 17 to 19 inches thick, is yellowish-red very friable soft micaceous fine sandy loam. It overlies yellowish-red, soft, decayed mica schist. Runoff is rapid, and the hazard of erosion is high. Internal drainage is medium to rapid.

As mapped this phase includes severely eroded areas, totaling about 585 acres, that have lost most of the surface soil. It also includes about 106 acres that are uneroded or only slightly eroded. These inclusions are similar to the eroded hilly phase in use suitability.

Use and management (Group C–1).—Louisa fine sandy loam, eroded hilly phase, is made up of areas that have been cleared and cultivated, burned over, or severely cut over. As a result, moderate erosion took place before native vegetation began to establish itself. About 90 percent is now in second-growth pine, and the rest is in pasture or idle. A few small areas are planted to corn and cotton, but yields are very low. Crops and pasture are not suited to this soil because of its poor to very poor workability, very poor conservability, and very low productivity.

Louisa fine sandy loam, rolling phase (6 to 10 percent slopes) (Lx).—This soil occupies long narrow ridge crests and has the mildest relief of any of the Louisa soils. It resembles Louisa fine sandy loam, steep phase, in all characteristics except its gentler slopes and somewhat thicker profile layers. The 6- to 7-inch surface soil is brown very friable micaceous fine sandy loam. A 2-inch layer of forest litter and leaf mold lies on the surface in forested areas. The 21-inch subsurface layer is a yellowish-red very friable, soft, micaceous fine sandy loam. This material is underlain by parent material consisting of yellowish-red, soft, decomposed mica schist.

Runoff is medium to rapid and the erosion hazard is moderate to high. Internal drainage generally is medium.

Mapped with this soil are small moderately eroded areas totaling about 89 acres and small severely eroded

areas totaling about 65. These eroded areas are indicated on the soil map by symbol. Also included are about 9 acres of Louisa fine sandy loam, eroded undulating phase. This inclusion differs mainly in its slope (2 to 6 percent) and in being somewhat eroded. All these inclusions are made because their acreage is relatively small and their use suitability is the same as that of Louisa fine sandy loam, rolling phase.

Use and management (Group C–1).—More than half of Louisa fine sandy loam, rolling phase, is in pine-hardwood forest. The rest is in crops and pasture or is idle. Even though the smooth surface relief is generally favorable for tillage, this soil is of limited value because of its inaccessibility. Crop and pasture yields are low to very low. The soil has good workability, but its conservability is poor. Erodibility, low fertility, and low moisture-holding capacity make this soil generally unsuitable for crops or pasture. For the most part it can be used best for forest.

LOUISBURG SERIES

The Louisburg soils are shallow and very friable. They are generally on very strong to strong upland slopes, although some areas are on smooth narrow ridgetops. The relief is dominantly hilly and steep, although some is rolling. The soils are somewhat excessively drained to excessively drained. They are associated with Appling and Cecil soils but differ in having a relatively shallow profile that shows no true subsoil development. They have formed in material weathered from granite gneiss or granite, and because of their shallowness are closely related to the parent rock.

The soils have a low organic-matter content and are medium acid. Productivity for crops and pasture is very low.

Louisburg sandy loam, steep phase (15 to 25 percent slopes) (Lyo).—This shallow light-colored soil occurs on very strong slopes or breaks along drainageways. Outcrops of the bedrock occur in many places. The soil areas are distributed throughout the county.

Profile in a forested area:

Surface soil—
0 to 5 inches, grayish brown very friable sandy loam; structureless; thin covering of forest litter.
Subsurface—
5 to 15 inches, yellow friable sandy loam; structureless.
Parent material—
15 inches +, white to light-gray very friable decayed granite high in quartz mineral.

The fertility of this soil is low. Runoff is rapid to very rapid. The erosion hazard is high to very high. Internal drainage is medium to rapid. The moisture-holding capacity is low to very low. Permeability is rapid to moderately rapid in the surface soil and moderately rapid to rapid in the subsurface layer.

Moderate erosion has affected about 1,084 acres. Erosion is severe on about 203 acres. On about 12 acres of this severely eroded soil, the slopes are more than 25 percent. All these areas are included because of small total acreage and similarity in use suitability.

Use and management (Group C–1).—About 90 percent of the relatively large total area of Louisburg sandy loam, steep phase, is in forest made up of a mixture of pines and hardwoods. The rest is about equally divided as pasture and idle land. The soil has poor to very poor workability, very poor conservability, and very low productivity that make it largely unsuited to crops and pasture. Its best use in nearly all places is for forest.

Louisburg sandy loam, hilly phase (10 to 15 percent slopes) (Lyo).—This soil occupies slopes descending from narrow ridge crests. It is somewhat excessively drained. It is associated with areas of Louisburg sandy loam, steep phase, throughout the county. It has characteristics similar to those of the steep phase, but the profile layers are somewhat thicker, and the slopes are not so steep.

The surface soil is grayish-brown very friable sandy loam about 6 inches thick. The subsurface layer is yellow friable sandy loam about 12 inches thick. The parent material, variable in thickness, is white to light-gray very friable disintegrated granite gneiss having a high quartz content, or it is disintegrated granite.

Runoff is rapid, and the erosion hazard is high. Internal drainage is medium to rapid. Over most of this soil erosion has been moderate, but it has been slight on about 383 acres and severe on about 326 acres.

As mapped this hilly phase includes about 187 acres of Worsham sandy loam, eroded hilly phase, about 62 acres of which have been severely eroded. This included soil occurs in narrow strips bordering drainageways and at the base of upland slopes; in many small areas its relief is rolling (6 to 10 percent slopes). It has a surface soil about 10 inches thick, consisting in the upper part of light-gray loose sandy loam and in the lower part of pale yellow (streaked with gray and brown) friable heavy sandy loam. The subsoil, about 28 inches thick, is light-gray (streaked with yellow) heavy sandy clay loam. In the lower part the color grades to white, mottled with pale yellow and weak brown. Natural drainage is poor.

Use and management (Group C–1).—Louisburg sandy loam, hilly phase, is largely in forest composed of mixed pines and hardwoods. Small parts are in pasture or are idle. The soil has fair workability but is difficult to conserve. Its productivity is very low. Shallowness, low fertility, low to very low moisture-holding capacity, and other unfavorable qualities of the soil make it generally unsuited to crops and pasture. The soil can be used best for forest.

Louisburg sandy loam, rolling phase (6 to 10 percent slopes) (Ly).—This soil consists of the smoothest areas of Louisburg sandy loam. It occupies narrow ridgetops and is somewhat excessively drained. This phase has gentler slopes and somewhat thicker profile layers than Louisburg sandy loam, steep phase, but otherwise the two soils are similar. It is associated with other members of the Louisburg series, as well as with soils of the Appling and Cecil series.

The surface layer of this soil is grayish-brown very friable sandy loam about 6 inches thick. The subsurface layer is yellow friable sandy loam about 12 inches thick. The parent material is white to gray very friable disintegrated granitic rock having a high quartz content. Rock outcrops are common.

The fertility of this soil is low. Runoff is medium to rapid, and the erosion hazard is moderate to high. In-

ternal drainage is medium to rapid, and the moisture-holding capacity is low. This soil occurs throughout the county.

For the most part, Louisburg sandy loam, rolling phase, is moderately eroded, but a few acres are severely eroded. Included is a total of about 23 acres having undulating relief (2 to 6 percent slopes) in which the soil is slightly to moderately eroded. These undulating areas are too small to map separately.

Use and management (Group C–1).—The aggregate area of Louisburg sandy loam, rolling phase, is small. A stand of mixed pines and hardwoods covers about 80 percent of this soil. The rest is idle or in pasture. Cotton and corn are grown on a few areas, but yields are very low. A few small areas may be used for other crops. The soil is easily worked but is relatively difficult to conserve. Productivity is very low. Because this soil is generally unfavorable for crops and pasture, it should be used principally for forest.

MADE LAND

Made land (0 to 2 percent slopes) [Ma].—This miscellaneous land type consists of areas that have been leveled or reworked for the landscaping of buildings, recreation areas, and parks, and for other construction.

Use and management (Group C–1).—Because of the special uses for made land, it has no agricultural value.

MADISON SERIES

The Madison series consists of a large red-land group of relatively deep soils having a noticeable quantity of mica flakes, particularly in the subsoil and parent material. These soils occupy uplands, where they range from the smooth interstream ridges down to the very strong slopes adjoining drainageways. They have formed from weathered products of quartz mica schist. For the most part, the relief is rolling and hilly, but it ranges from undulating to steep. Drainage is good to excessive. The Madison soils are associated with Cecil soils and resemble them to some extent. They differ, however, in having a larger mica content, a more friable subsoil, and, on the whole, a shallower depth to weathered rock.

The organic-matter content of the soils is moderate to low, and the reaction is medium to strongly acid. Productivity for crops and pasture ranges from medium to very low.

The Madison soils also occur closely associated in complexes with Grover and Louisa soils. Productivity for crops and pasture is medium to low or very low.

Madison fine sandy loam, eroded undulating phase (2 to 6 percent slopes) [Md].—This well-drained sandy soil occurs on broad smooth interstream ridges and mild slopes leading toward drainageways. It is characterized by its brown very friable surface soil and red friable clay loam subsoil. This soil is associated with Cecil, Grover, and Louisa soils. It is more friable and has a browner color and higher mica content than the Cecil and contains less sand and is darker colored than the Grover. Its profile is well developed, compared with the shallow weakly developed profile of the Louisa soils. The areas of this fairly extensive soil occur throughout the county.

Profile in a less eroded cultivated area:

Surface soil—
0 to 7 inches, brown very friable fine sandy loam; weak fine crumb structure; considerable quantities of mica flakes and small mica schist fragments.

Subsoil—
7 to 24 inches, red friable clay loam; moderate medium crumb to fine blocky structure; many mica flakes.
24 to 36 inches, red friable clay loam; moderate fine crumb structure; considerable quantity of mica flakes.

Parent material—
36 inches +, yellowish-red, soft, decayed, micaceous rock.

The surface soil ranges from about 2 to 7 inches in thickness. In the more eroded places the plow layer is reddish-brown friable heavy sandy loam or light clay loam. The subsoil ranges from about 14 to 17 inches in thickness.

The fertility of this soil is low. Runoff is slow to medium, and the erosion hazard is moderate. Internal drainage is medium. Permeability is moderately rapid to moderate in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate.

Some eroded areas are included with this soil because of their small aggregate area. About 53 acres are severely eroded and have lost 75 percent or more of the surface soil. About 32 acres have slight erosion and have lost very little surface soil.

Use and management (Group A–2).—Madison fine sandy loam, eroded undulating phase, is used principally for cultivated crops and pasture. Some, however, is idle and some is in pine forest. All crops common to the county are grown. The farmers getting the highest yields follow crop rotations and use moderate to large applications of fertilizer. The soil can be easily worked and has a moderate range of moisture content suitable for cultivation. Conservability is good and productivity is medium to low.

Control of erosion and maintenance of fertility are the principal management requirements for this soil. Effective practices include rotation of crops, strip-cropping, contour plowing, terracing, and adequate fertilization. The soil can be used for many crops, including corn, cotton, wheat, oats, rye, barley, alfalfa, grasses, lespedeza, crimson clover, soybeans, and cowpeas. Peaches also are suitable.

Madison fine sandy loam, rolling phase (6 to 10 percent slopes) [Me].—This soil has stronger slopes and is less eroded than Madison fine sandy loam, eroded undulating phase. The surface soil, about 8 inches thick, is brown very friable fine sandy loam containing many mica flakes and some small mica schist fragments. The subsoil, about 28 inches thick, is red friable clay loam, distinctly micaceous. The parent material varies in thickness and is composed of yellowish-red, soft, decayed micaceous rock.

This soil has medium to rapid runoff and is moderately to highly susceptible to erosion. Internal drainage is medium. Permeability is moderately rapid in the surface soil and moderate in the subsoil. The moisture-holding capacity is good.

Use and management (Group A–1).—About half of this soil is in pine-and-hardwood forest. The rest is cleared and used for cultivated crops and pasture. Crops common to the county are grown. Yields de-

pend to a large extent on the level of soil management and range from medium to low. The soil is easily worked and conserved. Corn, cotton, wheat, oats, rye, barley, alfalfa, lespedeza, grasses, crimson clover, soybeans, and cowpeas are suited to this soil. Erosion should be controlled and fertility should be maintained. Good management practices include use of long rotations, stripcropping, contour plowing, terracing, and the addition of fertilizers.

Madison fine sandy loam, eroded rolling phase (6 to 10 percent slopes) (Mf).—This extensive soil is well drained to somewhat excessively drained. It occurs on broad fairly smooth interstream ridges and on gradual slopes toward drainageways. It consists of rolling areas of Madison fine sandy loam that have undergone moderate erosion and have lost 25 to 75 percent of the original surface soil. The remaining surface soil is about 2 to 6 inches thick. In the less eroded areas it is brown very friable sandy loam. In the more eroded areas where subsoil material has been mixed in by plowing, it is reddish-brown friable heavy fine sandy loam or light clay loam. The subsoil and parent material are practically the same as in Madison fine sandy loam, rolling phase. Many mica flakes and small mica schist fragments are present in the surface soil.

Runoff is medium to rapid, and the erosion hazard is moderate to high. The soil is medium acid throughout its entire depth. The moisture-holding capacity is moderate. The moisture and applied plant nutrients are well retained. This soil occurs throughout the county and is important in the agriculture because of its relatively large acreage and use suitability.

Use and management (Group A–1).—More than half of this phase is cultivated. Some is in pasture, and the more eroded areas are idle or are growing up in pines. The soil works fairly easily but has only a moderate range of moisture content suitable for cultivation. Conservability is fair, and productivity under prevailing management is usually low. All the crops common to the county are grown. Farmers who obtain the highest yields use rotations in which corn, cotton, small grain, and lespedeza or other hay crops are grown. They apply moderate to large quantities of fertilizer. Under better management practices, yields improve somewhat.

The soil responds well to correct fertilization and other good practices. When properly managed, it is suitable for all crops commonly grown in the county. Control of erosion and the maintenance of high fertility are the chief management problems. Long rotations, stripcropping, contour plowing, and terracing are good ways of controlling erosion.

Madison fine sandy loam, hilly phase (10 to 15 percent slopes) (Mg).—This soil occupies strong short slopes near or leading to drainageways. It has stronger slopes, somewhat thinner profile layers, and generally more excessive drainage than the rolling phase; otherwise the two soils are similar.

The surface soil is a brown very friable fine sandy loam that contains numerous mica flakes and small mica schist fragments. The 26-inch subsoil is red friable clay loam containing an appreciable quantity of mica flakes. Underlying this layer is yellowish-red, soft, decayed micaceous rock.

This soil has rapid runoff and somewhat excessive drainage. Permeability is moderately rapid in the surface soil and moderate in the subsoil. The soil holds moisture well and has a moderate supply of organic matter.

Use and management (Group B–3).—The fairly small acreage of this soil is mainly in forest consisting of mixed pine and hardwoods. Some of the acreage, however, is in crops and pasture. Corn, lespedeza, and cotton are grown to some extent, but under common management yields are low or very low. Pasture or forest are the best use for this soil because of its hilly relief and erodibility. Pasture usually provides poor grazing under prevailing management. The soil has poor workability, and heavy machinery is difficult to use. Conservability is only fair, because the soil is susceptible to erosion. When demands of the farm are such that the soil must be kept in crops, terraces and stripcropping should be used. Long rotations with close-growing crops are necessary as much of the time as possible to maintain productivity and to control erosion. Proper amounts of fertilizer should be applied.

Madison fine sandy loam, eroded hilly phase (10 to 15 percent slopes) (Mh).—This soil consists of areas that have been eroded to a moderate degree. They occur on short strong slopes near or along drainageways. From 25 to 75 percent of the original surface soil has been removed. In the less eroded areas the remaining 2 to 5 inches is brown very friable fine sandy loam. In the more eroded areas where subsoil material has been mixed in by tillage, the surface layer is a reddish-brown friable heavy fine sandy loam or light clay loam. Many mica flakes and small mica schist fragments are present.

This soil is similar to the hilly phase in subsoil and parent material. It has rapid runoff and is somewhat excessively drained. The erosion hazard is great. Permeability is moderately rapid to moderate in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate.

Use and management (Group B–3).—Less than half of this soil is in crops and pasture. The rest is in forest or is idle. Many crops are grown, but under usual management yields are relatively low. Some farmers use close-growing crops for a longer period in the rotation than on soils of lesser slope. The suitability and management requirements of this eroded hilly phase are essentially the same as for Madison fine sandy loam, hilly phase.

Madison fine sandy loam, steep phase (15 to 25 percent slopes) (Mk).—This phase comprises the steepest areas of Madison fine sandy loam. It occupies breaks or very strong slopes adjacent to drainageways and is somewhat excessively to excessively drained. The surface soil is brown very friable fine sandy loam, 5 to 6 inches thick. It contains numerous mica flakes and some small mica schist fragments. The subsoil, about 24 inches thick, is red, friable, micaceous clay loam. Underlying this layer is the parent material composed of yellowish-red, soft, decayed mica schist rock.

The fertility of this soil is low, and the reaction is medium acid. Runoff is rapid to very rapid, internal drainage is medium, and the erosion hazard is high to very high. The organic-matter content is moderate.

Areas of Madison fine sandy loam, eroded steep

phase, totaling about 230 acres—areas too small to be shown separately on the map—are mapped with this soil. Also included are about 49 acres that have slopes of more than 25 percent.

Use and management (Group C–1).—Nearly all of the relatively small acreage of Madison fine sandy loam, steep phase, is covered with pine-and-hardwood forest. This soil is difficult to very difficult to work and to conserve, principally because of its very strong slopes. Productivity is very low. The soil is suitable only for forest.

Madison gravelly sandy loam, rolling phase (6 to 10 percent slopes) (Ml).—This friable, well drained to somewhat excessively drained, reddish soil occurs on fairly smooth interstream ridges and moderate slopes descending toward drainageways. Numerous mica schist and quartzite fragments make this soil gravelly and differentiate it from Madison fine sandy loam, rolling phase.

Profile in a cultivated area:

Surface soil—
0 to 8 inches, brown very friable sandy loam; gravelly because of the small mica schist and quartzite fragments that make up about 25 percent of the soil mass; many mica flakes; weak fine crumb structure.

Subsoil—
8 to 24 inches, red friable clay loam; moderate medium crumb to fine blocky structure; many mica flakes.
24 to 36 inches, red friable clay loam; moderate fine crumb structure; contains a relatively large quantity of mica flakes.

Parent material—
36 inches +, yellowish-red, soft, decayed micaceous rock.

This soil is low in fertility and usually has a moderate supply of organic matter. It is medium acid. Runoff is medium to rapid, and the erosion hazard is moderate to high. Internal drainage generally is medium. The surface soil is rapidly permeable, and the subsoil is moderately permeable. The soil holds moisture moderately well.

Included with this rolling phase as mapped are areas of Madison gravelly sandy loam, undulating phase (2 to 6 percent slopes). They total about 181 acres and are generally moderately eroded because they have lost 25 to 75 percent of the surface soil. A small part is only slightly eroded.

Use and management (Group A–1).—The total area of Madison gravelly sandy loam, rolling phase, is small. About half of it is forested with pines and hardwoods. The rest is in crops and pasture. The usual crops of the county are grown, and under common management the yields are generally low. The soil is fairly easy to work and to conserve. Productivity depends largely on the level of management and ranges from medium to low.

The soil responds well to proper fertilization and other suitable practices. When well managed it is suited to all crops common to the county. Long rotations, stripcropping, contour plowing, terracing, and adequate fertilization should be used to control erosion and maintain fertility.

Madison gravelly sandy loam, eroded rolling phase (6 to 10 percent slopes) (Mm).—This soil has been moderately eroded; it has lost 25 to 75 percent of its surface soil. Otherwise it is similar to Madison gravelly sandy loam, rolling phase. The remaining sandy surface soil, about 2 to 6 inches thick, is brown very friable gravelly sandy loam. In the more eroded cultivated areas the surface soil has been mixed with red subsoil material to plow depth, and the result is a reddish brown friable heavy gravelly sandy loam or light clay loam.

This soil has medium to rapid runoff, and the erosion hazard is moderate to high. The surface soil is moderately to rapidly permeable, and the subsoil is moderately permeable. The soil is medium acid.

Some areas are severely eroded but are included because of their small aggregate areas—about 432 acres. Most of the original gravelly sandy loam surface soil has been lost. In cultivated areas the remaining surface soil has been mixed with upper subsoil material by tillage, and as a result the plow layer is reddish-brown to red friable clay loam.

Use and management (Group A–1).—The largest part of this soil is in cultivation, but some is in pasture and forest and some is idle. Crops common to the county are grown, but yields under prevailing management are usually low. The soil is fairly easy to work and to conserve. Productivity depends to a large extent on soil management and ranges from medium to low. Some farmers use rotations of corn, cotton, small grains, and lespedeza or some other hay crop and apply moderate to large amounts of fertilizer. Improved yields are obtained with this management. Long rotations, stripcropping, contour plowing, terracing, and proper fertilization help control erosion and maintain productivity.

Madison clay loam, severely eroded rolling phase (6 to 10 percent slopes) (Mb).—This soil occurs on smooth interstream ridges and moderate slopes leading toward drainageways. It covers a relatively small acreage and consists of areas, originally Madison fine sandy loam, rolling phase, that have lost nearly all or all the original sandy loam surface soil through severe erosion. The plowed layer, mostly subsoil material, is red to reddish-brown friable clay loam.

Profile in a cultivated area:

Surface soil—
0 to 5 inches (plow layer), red to reddish-brown friable clay loam; weak fine crumb structure; considerable quantity of mica flakes.

Subsoil—
5 to 18 inches, red friable clay loam; moderate medium crumb to fine blocky structure.
18 to 30 inches, red friable clay loam; moderate fine crumb structure; large number of mica flakes.

Parent material—
30 inches +, yellowish-red, soft, decomposed micaceous rock.

The subsoil ranges from about 23 to 25 inches in thickness.

The fertility of this soil is low, and the organic-matter content is fairly low. Runoff is medium to high; erosion hazard is moderate to high. Internal drainage is medium. Permeability and moisture-holding capacity are moderate.

Use and management (Group B–1).—Although Madison clay loam, severely eroded rolling phase, has at some time been used for crops, about half has now reverted to pine trees. Most of the rest is idle, but some is in pasture and in crops. Yields are low for

the pasture and the few crops grown. The soil has poor workability and a narrow range of moisture content suitable for cultivation. Because of severe erosion and other unfavorable features, the soil can be used for deep-rooted perennial legumes or trees.

Madison clay loam, severely eroded hilly phase (10 to 15 percent slopes) [Mc].—This soil consists of eroded areas on strong short slopes near or adjacent to drainageways. These areas were originally Madison fine sandy loam, hilly phase, but practically all or all the original brown sandy surface layer has been lost. The soil has a relatively small total acreage, and the areas are generally associated with the other hilly Madison soils. Practically all areas were once cleared for cultivation.

To plow depth the soil is red to reddish-brown friable clay loam. The subsoil, about 21 to 23 inches thick, is red friable clay loam. A large quantity of mica flakes occurs in the lower part. The parent material varies in thickness and consists of yellowish-red, soft, decomposed mica schist.

The fertility of this soil is low. Runoff is high, and internal drainage is medium. The hazard of erosion is high, but soil permeability and moisture-holding capacity are moderate.

In some areas, totaling about 155 acres, the slopes are steep, ranging between 15 and 25 percent. For the most part, however, this included soil is similar to the severely eroded hilly phase. It is included because of small extent and similar use suitability.

Use and management (Group C–1).—About half of Madison clay loam, severely eroded hilly phase, is in forest consisting almost entirely of second-growth pine. Most of the rest is idle, but some areas are in pasture, and some are cultivated. The soil has very poor workability, poor conservability, and very low productivity. These unfavorable features and the impracticability of controlling erosion restrict the use of this soil principally to forest.

Madison-Grover-Louisa gravelly sandy loams, hilly phases (10 to 15 percent slopes) [Mc].—This is a complex of Madison, Grover, and Louisa soils that occupies strong slopes near or next to drainageways. The areas of each soil are too small or too intricately associated to be separated on the soil map. The Grover soil is lighter colored than the Madison. The Louisa has a reddish color somewhat like that of the Madison but is more micaceous and shallower and has no true subsoil. The small rock fragments that make the soils gravelly are mainly mica schist. The strong relief and erodibility limit use largely to pasture and forest.

In the Madison soil areas, the surface soil is brown very friable gravelly sandy loam about 9 inches thick. The subsoil, about 26 inches thick, is red friable clay loam that contains many mica flakes. The parent material is yellowish-red, soft, decomposed micaceous rock.

The areas of Grover soil have a light olive-yellow friable gravelly sandy loam surface soil about 10 inches thick, a reddish-yellow to brownish yellow friable sandy clay loam subsoil, and a brownish-yellow parent material of partly decayed micaceous rock.

In the Louisa soil areas the surface soil, 5 to 6 inches thick, is brown very friable gravelly sandy loam containing much mica. The subsurface layer is yellowish-red, soft, very friable micaceous sandy loam about 19 inches thick. The parent material is composed of yellowish-red, soft, decayed mica schist rock.

The soils of this complex are low in fertility, medium to strongly acid, and moderate to low in organic-matter content. They have rapid runoff and are highly susceptible to erosion. Their permeability is moderately rapid to moderate in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate to very low.

Use and management (Group B–3).—The small aggregate area of Madison-Grover-Louisa gravelly sandy loams, hilly phases, is mainly in pine-and-hardwood forest. Small percentages are in cultivated crops and in pasture. Corn, lespedeza, and cotton are grown, but under the management practiced the yields are very low. Pasture is poor under the usual management.

The soil has poor workability and fair to poor conservability. It has a narrow to very narrow suitability range and is best for pasture or forest. If areas must be used for crops, practices for controlling erosion and maintaining productivity include terracing, stripcropping, and use of long rotations that keep close-growing crops on the soil most of the time. Adequate fertilization is also needed.

Madison-Grover-Louisa gravelly sandy loams, eroded hilly phases (10 to 15 percent slopes) [Mp].—This complex consists of former areas of Madison-Grover-Louisa gravelly sandy loams, hilly phases, that have lost 25 to 75 percent of the original surface soil through erosion.

In the Madison soil areas, the remaining surface soil, about 2 to 5 inches thick, is brown very friable gravelly sandy loam. However, where erosion has carried away most of the original surface layer, the soil to plow depth contains subsoil material mixed in by tillage and is reddish-brown very friable gravelly heavy sandy loam or gravelly light clay loam.

In the Grover areas, the remaining surface soil, about 3 to 8 inches thick, is light olive-yellow friable sandy loam. In the more eroded areas some reddish-yellow subsoil material has been mixed in by tillage.

In the Louisa area, the remaining surface soil, about 2 to 4 inches thick, is brown very friable gravelly micaceous sandy loam, but where underlying material has been mixed with surface soil by tillage, the plow layer is reddish brown.

The other profile layers of the three soils are similar to corresponding layers in the complex of uneroded hilly phases.

In these eroded hilly phases fertility, runoff, erosion hazard, permeability, moisture-holding capacity, and reaction are practically the same as in the uneroded hilly phases. The organic-matter content ranges from moderate to low.

Use and management (Group B–3).—Madison-Grover-Louisa gravelly sandy loams, eroded hilly phases, are about twice as extensive as the uneroded hilly phases. About half the total area is in forest consisting mostly of pines. The rest is mainly idle or in pasture. A small percentage, however, is in crops, usually corn, lespedeza, and cotton. Under prevailing management, crop and pasture yields are low to very

low. The soils are difficult to work and to conserve. Their unfavorable characteristics limit their use largely to pasture and forest. If these soils are used for crops, the management requirements for control of erosion and maintenance of fertility are the same as given for Madison Grover-Louisa gravelly sandy loams, hilly phases.

Madison-Grover-Louisa gravelly sandy loams, steep phases (15 to 25 percent slopes) (Mr).—This complex occupies breaks or short very strong slopes adjacent to drainageways. It differs from Madison-Grover-Louisa gravelly sandy loams, hilly phases, principally in having stronger slopes and generally slightly thinner profile layers.

Runoff is rapid to very rapid, and natural drainage is somewhat excessive to excessive. The erosion hazard is high to very high, and the moisture-holding capacity is moderate to very low. The supply of organic matter is moderate to low, and the reaction is medium to strongly acid.

Small areas of Madison-Grover-Louisa gravelly sandy loams, eroded steep phases, totaling about 149 acres, are included with this complex as mapped. They differ mainly in having lost 25 to 75 percent of the surface soil. Included also are small areas, totaling about 171 acres, that have lost nearly all or all the surface soil as a result of severe erosion. These areas are indicated on the soil map by symbol.

Use and management (Group C–1).—Almost all the small aggregate area of Madison-Grover-Louisa gravelly sandy loams, steep phases, is in pine-hardwood forest. Pasture and idle land occupy about 5 percent each. Workability and conservability of the soils are poor to very poor, and productivity is very low. The steep slopes and great risk of erosion when areas are cleared restrict use of these soils almost wholly to forest.

Madison-Grover-Louisa gravelly clay loams, severely eroded hilly phases (10 to 15 percent slopes) (Mn).—This complex is made up of hilly areas, originally Madison-Grover-Louisa gravelly sandy loams, that have been so eroded that very little or none of the original surface soil remains. In areas once cultivated, the plow layer of the Madison soil is red to reddish-brown friable gravelly clay loam; that of the Grover soil, light olive-yellow to reddish-yellow friable gravelly clay loam; and that of the Louisa soil, reddish-brown to yellowish-red very friable micaceous gravelly sandy loam. The other profile layers of these soils are similar to the respective layers in the complex of uneroded hilly phases. The gravel present in the soils is mostly composed of small mica schist fragments. Many shallow gullies have formed.

The soils are low in fertility and organic matter and are medium to strongly acid. Runoff is rapid, and the erosion hazard is high. The moisture-holding capacity is moderate to very low.

Use and management (Group C–1).—Almost all of the relatively small acreage of Madison-Grover-Louisa gravelly clay loams, severely eroded hilly phases, is in second-growth pine forest. This complex of soils has very poor workability, poor to very poor conservability, and very low productivity. Largely because of the strong slopes and severe erosion, it is best used for forest.

MECKLENBURG SERIES

The Mecklenburg soils are on uplands. They range from fairly smooth interstream ridges down to strong slopes near or adjacent to drainageways. Relief is rolling to hilly; drainage is moderately good. The soils have formed from materials weathered from dark-colored basic rocks, mainly diorite. Because of similarity in parent material, they are closely related to Davidson and Iredell soils. They are intermediate between them in color and consistence, particularly in color and consistence of the subsoil. In most places small fragments of the parent rock strewn over surface and mixed in the surface soil make the texture gravelly.

The soils are deep to moderately deep; they have a moderate to low organic-matter content and are slightly acid. Productivity for crops and pasture is low to very low.

Mecklenburg gravelly sandy loam, eroded rolling phase (6 to 10 percent slopes) (Mf).—This soil is characterized by a brown gravelly surface soil and a reddish-brown to yellow firm clay subsoil, somewhat mottled with other colors. The soil areas are small and their total acreage is very small.

Profile in a less eroded cultivated area:

Surface soil—
0 to 6 inches, dark grayish-brown friable sandy loam; small fragments of diorite rock make up about 20 percent of the soil mass; weak fine-crumb structure.

Subsoil—
6 to 16 inches, reddish-brown firm clay; a few faint medium mottles of brown and red; moderate medium blocky structure; plastic and sticky when wet; some ironstone concretions.
16 to 41 inches, yellow firm clay; moderate number of distinct medium mottles of olive yellow; moderate coarse blocky structure; plastic and sticky when wet; some weathered rock fragments.

Parent material—
41 inches +, light olive-gray to olive, soft, decayed diorite rock.

The thickness of the surface soil varies from about 3 to 7 inches, but in a few less eroded areas it may be as much as 10 inches. In cultivated fields where subsoil material has been mixed with surface soil, the plow layer is reddish-brown friable gravelly sandy loam to heavy sandy loam. The thickness of the subsoil ranges from about 33 to 35 inches.

This soil is moderate in fertility and retains its supply of plant nutrients moderately well. It usually has a moderate organic-matter content in the less eroded areas, but a low content in the more eroded areas. Runoff is medium to rapid, and internal drainage is slow because of the heavy consistence of the subsoil. Permeability of the surface soil is moderate to slow.

About 20 acres that have undulating relief (2 to 6 percent slopes) are included with this soil. Areas totaling about 9 acres that have lost practically all of the original surface layer are also included. The included soils are too small to be shown separately on the map.

Use and management (Group A–1).—Most of Mecklenburg gravelly sandy loam, eroded rolling phase, is in crops and pasture. Some areas are idle and some are in forest. Corn and cotton are the chief crops. Corn receives a complete fertilizer at planting

time and is sidedressed with nitrogenous fertilizer when the crop is about 40 days old. Cotton is also given a complete fertilizer at planting time and a nitrogenous side dressing when it is chopped. Cotton matures later on this soil than on the better areas, and, consequently, is subject to greater damage by boll weevils. Yields of corn and cotton range from low to medium, depending largely on the kind of management the soil has received.

The soil has poor workability, and the range of moisture content that will allow cultivation without clodding is somewhat narrow. The soil is moderately to highly susceptible to erosion, and the control of runoff and maintenance of fertility require much care. The effects of turning under green-manure crops or of applying barnyard manure are lasting, because the heavy subsoil holds the plant nutrients and prevents rapid leaching. The soil is suitable for many crops, including corn, cotton, wheat, rye, barley, oats, grasses, alfalfa, lespedeza, crimson clover, and vetch.

Mecklenburg gravelly clay loam, eroded hilly phase (10 to 15 percent slopes) (Ms).—This soil occurs on strong slopes near or adjacent to drainageways. It consists of hilly areas, originally of Mecklenburg gravelly sandy loam, that have lost 25 to 75 percent of the surface soil through moderate erosion.

The remaining surface soil, about 2 to 6 inches thick, consists of dark grayish-brown friable gravelly clay loam. In the more eroded cultivated parts, however, it is reddish-brown friable gravelly clay loam because reddish subsoil material has been mixed in by plowing. The subsoil is about 29 to 32 inches thick. It is reddish-brown, mottled with brown and yellow, firm clay in the upper part; and yellow, mottled with olive-yellow, firm clay in the lower part. Beneath this is the parent material composed of light-gray to olive, soft, decayed basic rock.

The soil is associated with the eroded rolling phase in different parts of the county; its total acreage is small. Runoff is rapid, and internal drainage is slow.

As mapped this soil includes about 95 acres that have been severely eroded and have lost all or nearly all the surface soil. It also includes about 36 acres that have slopes of 15 to 25 percent.

Use and management (Group C–1).—More than half of Mecklenburg gravelly clay loam, eroded hilly phase, is in crops and pasture. The rest is about equally divided as idle land and forest. In the forested areas the trees are principally second-growth pine. The soil has very poor workability. Susceptibility to erosion is high, and erosion control and maintenance of productivity are therefore difficult. Because of problems caused by hilly relief, the soil is poorly suited to tilled crops. It can be used best for forest, or possibly, in places, for pasture.

MIXED ALLUVIUM

Mixed alluvium, well drained (0 to 2 percent slopes) (Mu).—This miscellaneous land type is made up of different layers of sediment that have been deposited on level or nearly level flood plains by running water. The material has come partly from uplands upstream but mostly from adjacent uplands. This land type was formed as a result of soil-material accumulation rather than soil-development processes. It consists of different soil areas that are so small, so intimately mixed, and so variable in color, texture, and consistence that it is impractical to separate them on the soil map. In some places small bodies of Congaree, Starr, and Seneca soils are interspersed among areas of this mixed alluvium.

Mixed alluvium, well drained, ranges in composition from friable heavy silt loam to loose sand. Usually the sandy layers are nearest the surface and the heavier, finer textured material is in layers at lower depths. Because of great variability in the organic-matter content, the color ranges from light gray to dark gray.

This land type covers relatively large acreage along some of the streams. Its fertility is moderate. It has slow to very slow runoff and medium internal drainage. The reaction is medium to strongly acid. Permeability is moderate, and the moisture-holding capacity very high.

Use and management (Group A–5).—More than half of Mixed alluvium, well drained, is in crops and pasture. The rest is in forest or is idle. The principal crops are corn and hay. The fertilizers applied are similar to those used on the Congaree soils, but yields usually are lower. This mixed alluvium is fairly easy to work and very easy to conserve; it has medium productivity. Corn, hay, pasture, and some late vegetables are well suited. Management requirements are similar to those for the Congaree soils.

Mixed alluvium, somewhat poorly drained (0 to 2 percent slopes) (Mv).—This miscellaneous land type is similar to Mixed alluvium, well drained, in soil characteristics. It differs chiefly in drainage, but the water table is also higher in most places. This Mixed alluvium is about one-third as extensive as the well-drained Mixed alluvium. It occurs in first bottoms along some of the streams, where it is subject to periodic overflow.

The fertility of this land type is moderate. The organic-matter content ranges from low to medium. The soil material is medium to strongly acid. Runoff is very slow, and internal drainage is slow. Permeability is moderate in the upper part and slow in the lower. The moisture-holding capacity is very high.

Use and management (Group A–6).—The greater part of Mixed alluvium, somewhat poorly drained, is in pasture and forest. The rest is idle or cultivated. Trees in the forested areas are chiefly alder, willow, and sweetgum, but there are some pines. The soil is not easy to work and has low productivity. It is easily conserved. Corn is the principal crop; it is fairly well suited but may be damaged by floods. Improvement of drainage would increase corn production, but this is not feasible in many places. Pasture is well suited.

Mixed alluvium, poorly drained (0 to 2 percent slopes) (Mw).—This miscellaneous land type is made up of interbanded alluvial material similar to that of Mixed alluvium, well drained, but it is waterlogged most of the time. It has moderate fertility, contains a variable quantity of organic matter, and is medium to strongly acid. The total area is about one-fifth as

large as that of the well-drained Mixed alluvium. Drainage for crops and pasture is impractical in most places.

Use and management (Group B–2).—A large percentage of Mixed alluvium, poorly drained, is in forest. Smaller percentages are in pasture or are idle. The trees in the forested areas are almost entirely alders and willows. Small vegetation consists principally of reeds and marshgrasses. If adequately drained, the land is suitable for pasture. Because of the difficulty of obtaining good drainage, however, most of it should be kept in forest.

MOLENA SERIES

The soils of the Molena series are on high stream terraces that are apparently very old. They formed in old alluvium derived from uplands underlain principally by granite and gneiss, but in places by basic rock. They are associated with the Hiwassee soils and have a profile of similar color. Molena soils, however, have a very friable porous sandy profile that is fairly low in clay content and shows only slight differences in consistence and structure throughout its entire depth.

The relief is largely undulating but ranges from undulating to hilly. The somewhat excessive to excessive drainage of the Molena series is caused largely by the open sandy consistency. In places the profile varies considerably from the usual red color. A variant having a profile of lighter color therefore is recognized and mapped.

The organic-matter content of the series is low, and the reaction is slightly to medium acid. Productivity for crops and pasture is low to very low.

Molena loamy sand, eroded undulating phase (2 to 6 percent slopes) (My).—Superficially this soil has the appearance of the associated Hiwassee soils, but it is sandy throughout, whereas the well-developed Hiwassee soils have a friable clay loam subsoil that retains organic matter and applied plant nutrients. It is very small in extent and occurs mainly on high terraces along the Chattahoochee River.

Profile characteristics in a cultivated area:

Surface soil—
- 0 to 12 inches, brown very friable loamy sand; structureless.
- 12 to 24 inches, yellowish red very friable loamy sand; structureless.

Subsurface—
- 24 to 36 inches, red very friable sandy loam; very weak medium-granular structure.
- 36 to 45 inches, red very friable sandy loam; structureless.

Underlying material—
- 45 inches +, friable old alluvial material of sand and loamy sand.

The profile layers vary somewhat in thickness from place to place.

This soil is low in fertility and slightly acid. Runoff is slow to medium, and internal drainage is rapid. The soil is very permeable to roots, moisture, and air and has a low capacity for retaining moisture and applied plant nutrients.

About 20 acres of rolling areas (6 to 10 percent slopes) and about 9 acres of hilly areas (10 to 15 percent slopes) are too small to justify separation on the soil map and are included with this soil.

Use and management (Group C–1).—Nearly all of Molena loamy sand, eroded undulating phase, is cleared. About half of it is in crops and pasture. The rest is idle or in forest. Cotton, corn, and small grains are the chief crops. Watermelons, peanuts, sweetpotatoes, and cowpeas are suitable if properly fertilized. Yields range from low to medium; they vary according to the amount of rainfall during the growing season.

The soil is very easy to work and can be worked within a wide range of moisture content. Conservability, especially of plant nutrients, is only fair. The soil, however, like many other sandy soils, responds readily to fertilization. Because it does not hold moisture or applied plant nutrients well and tends to dry out, this soil is poorly suited to crops and pasture. It is very good for growing stolons of coastal bermudagrass if ample fertilizer and water are applied.

Molena loamy sand, light colored variant (2 to 10 percent slopes) (Mx).—This soil is associated with Hiwassee soils and Molena loamy sand, undulating phase, and is somewhat excessively drained. It is distinctly sandier than the Hiwassee soils, especially in its subsurface layers, and is lighter colored than the Hiwassee and the associated Molena soil. It has formed from materials washed from Cecil, Madison, and Appling soils. The soil has mainly rolling relief, but about 25 percent is undulating and a few acres are hilly. It occurs mostly along the Chattahoochee River, and its total extent is very small.

Profile in a cultivated area:

Surface soil—
- 0 to 4 inches, yellowish-brown very friable loamy sand; structureless.
- 4 to 12 inches, yellowish-brown very friable sandy loam; very weak fine crumb structure.

Subsurface—
- 12 to 30 inches, yellowish-brown friable fine sandy loam; weak fine crumb structure; more fine-textured material than in the layers above.
- 30 to 40 inches, brownish yellow friable fine sandy loam; red distinct medium mottles in moderate numbers; weak fine crumb structure; small quantities of coarse sand and fine gravel.

Underlying material—
- 40 inches +, brownish-yellow friable sandy loam of old alluvial material; moderate number of red, distinct, coarse mottles; some fine gravel.

Minor variations occur in the color, texture, and thickness of the profile layers.

This soil is low in fertility and medium acid. Runoff is slow to rapid, and internal drainage is rapid. Permeability through the surface soil is rapid; through the subsurface layers, moderately rapid. The moisture-holding capacity is moderately low, but the capacity of the soil to retain applied plant nutrients is fairly good.

Included with this soil as mapped are about 2 acres of light-gray loamy fine sand. The soil is lighter colored and sandier throughout the profile. It is included because it is not large enough to be shown separately on the map.

Use and management (Group A–2).—About half of Molena loamy sand, light colored variant, is in crops and pasture. The rest is idle or in forest. The range

of crop suitability is similar to that of Molena loamy sand, eroded undulating phase.

Corn, cotton, and small grains are the principal crops. Yields depend on the soil management and the abundance of rainfall during the growing season; they range from low to medium. Cotton and corn receive a mixed fertilizer and, after they have made some growth, a side dressing of nitrogen fertilizer. Small grains are also given a mixed fertilizer and later on a topdressing of nitrogen fertilizer. If the small grain follows a heavily fertilized crop, only the topdressing is applied.

Molena loamy sand, light colored variant, is physically suited to many crops, but its tendency toward droughtiness often restricts yields. It quickly responds to applications of fertilizer. Deep-rooted crops should do fairly well in summer and early in fall, but winter and spring crops receive a more favorable distribution of rainfall. This soil can be cultivated within a wide range of moisture content. Contour tillage, terracing, and striperopping are suitable erosion control measures, especially on the stronger slopes.

RIVERWASH

Riverwash (0 to 2 percent slopes) (Ra).—Riverwash is a miscellaneous land type that consists of loose sand recently deposited, usually near banks of streams. Its total extent is very small. It ranges from almost white to reddish brown in color and from less than a foot to several feet in depth. Relief generally is level or nearly level, but about 9 acres of this land type consists of steep streambanks having a gradient of 25 percent or more.

Use and management (Group C–1).—Practically all of this miscellaneous land type is in trees. A few small areas may be used like the soils of the adjacent first bottoms, but yields are very low on the Riverwash areas. This loose porous sandy material dries out readily and is subject to overflow. It is therefore very poorly suited to crops and pasture.

SENECA SERIES

The soils of the Seneca series occupy foot slopes and positions along drainageways. They have formed from local colluvial and alluvial materials derived mainly from Appling, Cecil, and Madison soils. The relief is prevailingly undulating, but some is level. Drainage is good. Although the soils are relatively deep, a true subsoil generally is not present. The underlying friable colluvial or alluvial materials may vary somewhat in color, texture, and consistence.

The soils usually have a low organic-matter content and are slightly acid to medium acid. Productivity is medium to low.

Seneca fine sandy loam, undulating phase (2 to 6 percent slopes) (Sb).—This very friable soil is associated with Appling, Cecil, and Madison soils that occur on the adjacent slopes. The areas of this soil are small and are scattered throughout the county.

Profile in a cultivated area:

Surface soil—
0 to 18 inches, dark grayish-brown very friable fine sandy loam; very weak fine crumb structure.

Subsurface—
18 to 30 inches, grayish-brown friable fine sandy loam; very weak fine crumb structure.

Underlying material
30 inches +, friable colluvial material of sand, silt, and clay.

The profile layers vary to some extent in color, texture, and thickness.

This soil is generally low in fertility. Runoff is medium to slow, and internal drainage is medium. Permeability is moderately rapid in the surface soil and moderate in the subsurface layer. The moisture-holding capacity is good.

Included with this phase are about 6 acres where the soil has accumulated on steep slopes (25 percent or more) instead of washing to lower levels.

Use and management (Group A–3).—The larger part of Seneca fine sandy loam, undulating phase, is cultivated. Some is used for pasture and forest, and some of the acreage is idle. The crops and management practices are similar to those on the soils of the adjacent uplands, but yields are usually somewhat higher. Some areas located near farm homes are planted to gardens or truck crops.

The soil has good workability and good to fair conservability. Erosion is easily controlled. Local wash accumulates in places. The soil is suitable for corn, cotton, wheat, oats, rye, barley, crimson clover, lespedeza, cowpeas, soybeans, grasses, sorghum, sweetpotatoes, potatoes, melons, and vegetables.

Seneca fine sandy loam, level phase (0 to 2 percent slopes) (Sa).—This soil is similar to Seneca fine sandy loam, undulating phase, in all characteristics except slope. It is less extensive, however, and occurs in small scattered areas that are generally associated with Appling, Cecil, and Madison soils.

The soil varies somewhat in the color, texture, and thickness of the profile layers. It is low in fertility. Runoff is slow, and internal drainage is medium. Permeability is moderately rapid in the surface soil and moderate in the lower layers. The soil is moderately retentive of moisture.

Use and management (Group A–3).—Most of this level phase is in crops, and pasture. Some is in forest or is idle. The soil is managed in the same way as soils on the adjacent uplands, but yields generally are higher. Some areas near farm homes are used for gardens or truck crops. The soil is easy to work and to conserve and has medium to low productivity. The crops grown on the undulating phase are also well suited to this soil.

STARR SERIES

The Starr soils, like the Seneca, occupy foot slopes and positions along drainageways. They are similar to the Seneca soils in slope and drainage but differ in having a more loamy texture, redder color, and usually better productivity. They have formed from local colluvial and alluvial materials washed mostly from associated red soils, as the Lloyd, Davidson,

Cecil, and Madison. Their profile shows very little difference in color, texture, and consistence from the surface downward. In nearly all areas there is no evidence of true subsoil development.

The organic-matter content is generally moderate, and the soils are slightly acid to medium acid. Productivity is generally high.

Starr loam, undulating phase (2 to 6 percent slopes) (Sd).—In occurrence and formation, this soil is similar to Seneca fine sandy loam, undulating phase; but it is darker, is less sandy and less leached, and contains more organic matter. The soil occurs throughout the county and is relatively small in total extent.

Profile in a cultivated area:

Surface soil—
0 to 20 inches, yellowish-red friable loam; very weak fine crumb structure.
Subsurface—
20 to 30 inches, yellowish-red friable heavy loam; weak fine crumb structure.
30 to 35 inches, yellowish-red friable loam; light-gray distinct medium mottles are common; very weak fine crumb structure.
Underlying material—
35 inches +, friable colluvial material of sand, silt, and clay.

The layers of the profile vary somewhat in color, texture, and thickness from place to place.

The soil is comparatively high in fertility. It has medium to slow runoff and medium internal drainage. It is moderately permeable to roots, moisture, and air and has good moisture-holding capacity.

Use and management (Group A–2).—This soil is largely in crops and pasture. Some areas are idle and some are in forest. The soil is used for about the same crops and managed in about the same way as the associated Lloyd, Davidson, Cecil, and Madison soils. Productivity is high.

This soil is easily worked and conserved, and its productivity is fairly easily maintained. It is well suited to many crops, including corn, cotton, wheat, oats, rye, barley, crimson clover, alfalfa, cowpeas, soybeans, lespedeza, grasses, potatoes, melons, and vegetables.

Starr loam, level phase (0 to 2 percent slopes) (Sc).—This soil differs from Starr loam, undulating phase, principally in occupying level or nearly level areas. The areas of this phase are generally small and occur throughout the county.

The fertility of this soil is generally high. Runoff is slow and internal drainage is medium. Permeability and moisture-holding capacity are moderate.

Use and management (Group A–2).—Crops and pasture are the principal uses for this soil. Some areas are in forest and some are idle. The soil is farmed with the associated Lloyd, Davidson, Cecil, and Madison soils and is managed similarly. Workability and conservability are good, and productivity generally is high. Crops grown on the undulating phase are well-suited to this soil.

STONY LAND

Stony land, rolling (6 to 10 percent slopes) (Se).—This miscellaneous land type occupies areas in which outcropping bedrock occupies 10 to 50 percent of the surface. Many large boulders also occur. In most places the soil or soil material among the rocks is similar to that of Cecil or Lockhart soil. Where a soil mantle occurs, bedrock lies at depths of a few inches to several feet. Where the bedrock is near the surface, only a gray to yellowish-brown sandy surface soil has formed, but where it is at a greater depth the surface soil is underlain by yellowish-brown to red friable clayey soil material.

This miscellaneous land type is medium to strongly acid, low in organic matter in most places, and low in fertility. Runoff is medium to rapid, and the erosion hazard is moderate to great. Internal drainage, where established, is medium. Permeability is moderately rapid to moderate, and moisture-holding capacity in the deeper parts is moderate.

In a few areas, totaling about 27 acres, the relief is undulating (2 to 6 percent slopes). These areas are included because of their small extent and similar use suitability.

Use and management (Group C–1).—All the very small aggregate area of Stony land, rolling, is in forest consisting of a sparse stand of mixed pine and hardwoods. Stoniness, very poor workability and conservability, and low to very low productivity make this land type unsuited to crops and poorly suited to pasture. For the most part it is best used for trees.

Stony land, hilly (10 to 15 percent slopes) (Sf).—This miscellaneous land type differs from Stony land, rolling, principally in having stronger slopes. It has about the same percentage of rock outcrops and the same type of boulders, but in some places the soil surrounding the rocks may be a little shallower.

This land type is low in fertility and low in organic matter in most places. It is medium to strongly acid. Runoff is rapid, and internal drainage, where soil characteristics are favorable, is medium. The erosion hazard is high. Nearly half the aggregate area has been severely eroded, and a small part has been moderately eroded. Permeability is moderately rapid to moderate. In the deeper areas the water-holding capacity is moderate.

Use and management (Group C–1).—Stony land, hilly, occupies short strong slopes near or along drainageways. It is more extensive than Stony land, rolling, and all of it is in forest of mixed pines and hardwoods. Stoniness, very poor workability and conservability, and very low productivity make this hilly land unsuitable for crops and poorly suited to pasture. In practically all places its most feasible use is for forest.

Stony land, steep (15 to 25 percent slopes) (Sg).—In stoniness and character of soil material this miscellaneous land type is similar to Stony land, rolling, but it has stronger slopes. In general, the soil material among the rock outcrops and the large boulders is somewhat shallow. The outcrops and boulders cover about the same percentage of the surface as on the rolling Stony land. The areas of this steep land are on short, very strong slopes adjacent to drainageways.

This land type is low in fertility and in most places low in organic-matter content. It is medium to strongly acid. Runoff is rapid to very rapid, and the erosion hazard is high to very high. Internal drainage in the deeper soil areas between the rocks is medium.

Permeability is moderately rapid to moderate. In the deeper areas the soil retains moisture fairly well.

Although this stony land is prevailingly steep, it includes a total of about 194 acres in which the slopes are very steep, or more than 25 percent. These steeper areas make up only a relatively small part of the total and are included because their use suitability is similar to that of the less steep areas.

Use and management (Group C–1).—The relatively small aggregate area of Stony land, steep, is in forest consisting of a scant mixed stand of pines and hardwoods. This land is not suitable for crops or pasture because of its very strong slopes, high susceptibility to erosion, very poor workability, and very low productivity. It is best used for forest.

UNCLASSIFIED CITY LAND

Unclassified city land (Uc).—This land type occupies a relatively large part of Fulton County. It includes areas within and adjacent to cities (principally Atlanta). It is so altered or obscured by urban works and structures that identifying and mapping the soils is not feasible or would be of no value to the agriculture of the county. Group C–1.

WEHADKEE SERIES

The Wehadkee soils, located on low first bottoms subject to periodic overflow, are poorly drained. They are relatively deep, but the water table is usually high. They are associated with Congaree and Chewacla soils but are unlike them in being mottled throughout their entire depth. Other than color differences, their profile shows very little change from the surface downward.

The soils have a low organic-matter content.

Most of the land cannot be used for cultivated crops because of poor drainage, and in most places adequate drainage is difficult to obtain by artificial means. Productivity for pasture generally is low.

Wehadkee silt loam (0 to 2 percent slopes) (Wb).—This soil has formed from young alluvium consisting of material washed from upland soils. New alluvial material is added in places by floodwaters. Runoff is slow to very slow. In places drainage is so poor that the soil is semiswampy. Erosion is not a factor except possibly for some stream scouring in places during high water. Because of poor drainage, this soil has a narrower use range and lower productivity than the associated Congaree and Chewacla soils.

Profile in a cultivated area:

Surface soil
- 0 to 11 inches, olive-gray friable silt loam; medium distinct mottles of brown are common; weak fine crumb structure.

Subsurface—
- 11 to 19 inches, light brownish-gray friable silt loam; brown and gray distinct medium mottles in moderate numbers; moderate fine crumb structure.
- 19 to 36 inches, gray friable silt loam; yellow and brown medium mottles are common and easily visible; weak fine crumb structure.

Underlying material—
- 36 inches +, varicolored friable alluvial material composed mainly of a mixture of fine sand, silt, and clay.

The profile layers vary a little in thickness from place to place. The textures also vary, and layers of different alluvial material occur at various depths, especially in the lower part of the profile. The soil is friable when moist but is hard and cloddy when dry.

This soil has comparatively high fertility, but it is poorly supplied with organic matter. It is medium acid throughout the entire profile. Permeability is slow in the surface soil and very slow in the subsurface. The moisture-holding capacity is very high.

Mapped with this soil are about 565 acres of Wehadkee very fine sandy loam, which differs principally in texture. This very fine sandy loam is included because of only slight difference in texture and similar use suitability.

Use and management (Group B–2).—More than half of Wehadkee silt loam is in forest. The trees are chiefly alder, blackgum, and willow, and the undergrowth is mostly reeds and coarse marshgrasses. Pasture is generally confined to the better drained areas. Some of the soil is idle and a small percentage is tilled.

Poor drainage, very poor workability, low productivity, and other unfavorable features limit the use of this soil for crops. Late summer crops can be grown in the better drained places. In areas where adequate drainage can be obtained, corn does fairly well. The better drained areas and those that can be improved by artificial drainage, if properly seeded and otherwise well managed, are moderately well suited to pasture. Even in such places, coarse water-loving grasses that have low grazing value are likely to replace the more desirable pasture plants. Deepening and widening the channels of smaller streams, where practicable, would be necessary to obtain adequate drainage. Suitable engineering improvements along the larger streams would also improve drainage.

Wehadkee fine sandy loam (0 to 2 percent slopes) (Wa).—This soil differs from Wehadkee silt loam principally in containing more sand and in having a coarser texture throughout its profile.

The 12 inch surface soil is an olive-gray friable fine sandy loam, mottled with brown. The subsurface layer is about 26 inches thick. In the upper 9 inches it is a light brownish-gray friable fine sandy loam, mottled with brown and gray, but in the lower 17 inches it is a gray friable fine sandy loam mottled with yellow and brown. The surface soil and subsurface layer vary a little in texture, color, and thickness from place to place. The material underlying the subsurface layer is mottled friable alluvium composed largely of sand, silt, and clay.

Wehadkee fine sandy loam has slow to very slow runoff. In places new alluvial material is deposited during floods. Ordinarily erosion is not a hazard, but in places some stream erosion takes place. The water table is reasonably high. In general, the soil is poorly drained; in places drainage is so poor that swamps occur.

This soil has comparatively high fertility. It is medium acid throughout its entire depth. The surface soil is slowly permeable, and the subsurface material is very slowly permeable The moisture-holding capacity is very high.

Use and management (Group B–2).—More than half of this soil is forested. Most of the rest is idle or

in pasture. Only a small percentage is cultivated. Alder, blackgum, and willow are the principal trees. The undergrowth is mainly reeds and coarse marsh-grasses.

This soil has poor workability, good conservability, and low productivity. Because of unfavorable features, particularly poor drainage, it has a narrow range of suitability. Some of the better drained areas are used for pasture or late summer crops. If properly drained and given other needed management, the soil might produce good corn. Proper drainage also could be used to improve pastureland, but encroachment of coarse water-tolerant grasses would be a menace to pasture plants. Artificial drainage of this level soil is difficult. Among the drainage measures needed, if feasible, are the deepening and widening of channels of smaller streams and suitable engineering improvements along larger streams.

WICKHAM SERIES

The soils of the Wickham series occur on low or moderately low stream terraces and have deep friable profiles. Relief ranges from level to rolling but is dominantly undulating. Drainage is good. These soils have formed from moderately young alluvium composed of materials derived from Cecil, Appling, Madison, Lloyd, Davidson, and related soils. They differ from the associated Altavista soils in having a relatively dark-colored surface soil and a reddish-brown subsoil and in being better drained and usually more productive.

The Wickham soils have a moderate organic-matter content and are medium to strongly acid. They are used principally for crops and pasture; productivity is generally medium.

Wickham fine sandy loam, undulating phase (2 to 6 percent slopes) (Wc).—This well-drained soil occurs along streams throughout the country and in some places is subject to brief overflow during unusually high water. It has a very small aggregate area but is a useful soil because of its favorable characteristics and suitability for many different crops.

Profile in a cultivated area:

Surface soil—
- 0 to 6 inches, dark yellowish-brown friable fine sandy loam; weak medium crumb structure.
- 6 to 12 inches, dark-brown friable silt loam; weak medium crumb structure.

Subsoil—
- 12 to 30 inches, strong-brown firm silty clay loam; moderate medium blocky structure.
- 30 to 45 inches, yellowish-red friable silty clay loam; moderate medium blocky structure.

Underlying material—
- 45 inches +, friable alluvial material consisting principally of sand, silt, and clay.

The profile layers vary somewhat in thickness from place to place, and the subsoil varies in color from brown to reddish brown.

This soil has moderate fertility. Runoff is medium, and the erosion hazard is slight to moderate. Internal drainage is medium. Permeability is moderately rapid in the surface soil and moderate in the subsoil. The moisture-holding capacity is moderate. The soil is highly retentive of applied plant nutrients.

Mapped with this soil are about 59 acres of Wickham fine sandy loam, level phase (0 to 2 percent slopes), and about 10 acres of Wickham fine sandy loam, rolling phase (6 to 10 percent slopes). These soils were included because of their small extent, similar profile characteristics, and need for generally similar use and management. About 116 acres of Wickham silt loam, ranging from level to undulating, is also included. This soil has a much finer texture than Wickham fine sandy loam, undulating phase, but is similar in all other profile characteristics. Because of its fine texture, it can be satisfactorily cultivated within a somewhat narrower range of moisture content. Its use suitability and management needs are essentially the same as those of the Wickham fine sandy loam, undulating phase. The minor differences in these two soils do not justify separation of the silt loam on the soil map.

Use and management (Group A–2).—Most of Wickham fine sandy loam, undulating phase, is cultivated. Some is in pasture, and smaller parts are idle and in forest. Corn and hay are the chief crops. Generally, 3-year rotations are used.

Under common management corn averages about 20 bushels an acre and lespedeza about 1 ton of hay, but under good management corn averages about 45 bushels and lespedeza about 1½ tons. Other crops, as well as pasture, make similar responses to good management. Corn responds to complete fertilizers, and legumes to lime and phosphorus. Pasture is exceptionally well suited to this soil and will produce excellent stands of the better plants if adequately treated with lime and phosphorus. The soil is very easy to work and can be cultivated within a moderate range of moisture content. It is easy to conserve, but contour tillage will help control erosion on the stronger slopes. Among crops well suited to this soil are corn, cotton, wheat, oats, rye, barley, alfalfa, crimson clover, vetch, lespedeza, soybeans, cowpeas, grasses, potatoes, sweetpotatoes, melons, and vegetables.

Wickham fine sandy loam, eroded undulating phase (2 to 6 percent slopes) (Wd).—This soil is associated with Wickham fine sandy loam, undulating phase, and is almost as extensive. It differs in having lost 25 to 75 percent of the surface soil through erosion. The remaining surface layer is about 3 to 9 inches thick and consists of dark yellowish-brown friable fine sandy loam to silt loam. In the more eroded cultivated areas, subsoil material has been mixed with the remaining surface soil by tillage, and the soil to plow depth is dark-brown or reddish-brown, friable, heavy fine sandy loam to silt loam.

The fertility of this soil is moderate. Runoff is medium, and the hazard of further erosion is slight to moderate. Internal drainage is medium. Permeability is moderately rapid to moderate in the surface soil and moderate in the subsoil. The soil retains moisture and applied plant nutrients moderately well.

As mapped, a total of about 76 acres of Wickham fine sandy loam is rolling (slopes of 6 to 10 percent). About 25 acres was originally Wickham silt loam, undulating phase, but is now moderately eroded. Both the rolling and the eroded silt loam areas are included because of their small extent and, in general, their similarity in use suitability and management needs.

Use and management (Group A–2).—A large part of Wickham fine sandy loam, eroded undulating phase, is cultivated. Some, however, is in pasture, and small parts are idle and in forest. This soil has very good workability, good conservability, and medium productivity. The use suitability and management requirements of this soil are practically the same as those of Wickham fine sandy loam, undulating phase, but in places more intensive management practices are needed to control erosion.

WORSHAM SERIES

The soils of the Worsham series occupy seepy places on lower upland slopes, around drainage heads, and along drainageways. For the most part these soils have formed in colluvium derived from Appling and Cecil soils on the adjacent slopes. They differ from these soils in having a lighter colored profile and a heavy claypan subsoil that retards internal drainage. They are similar to Seneca and Starr soils in mode of occurrence and formation, but they differ in being poorly drained and streaked or mottled throughout most of the profile. Although the relief is dominantly undulating, some is level and some rolling.

The Worsham soils are low in organic-matter and strongly acid. Their principal uses are for forest and pasture. Productivity for pasture and crops is usually very low.

Worsham sandy loam, undulating phase (2 to 6 percent slopes) (We).—This soil occurs in small areas throughout the county. Much of it receives runoff and seepage water from higher slopes and has developed under waterlogged conditions. Because of very slow internal drainage, very low productivity, and related unfavorable characteristics, the soil has very little value for farming.

Profile in a cultivated area:

Surface soil—
- 0 to 6 inches, light brownish-gray loose sandy loam; very weak fine crumb structure.
- 6 to 12 inches, pale-yellow friable heavy sandy loam; distinct coarse mottles (streaks) of gray and brown; weak fine blocky structure.

Subsoil—
- 12 to 36 inches (claypan), light-gray, friable, heavy sandy clay loam; distinct coarse mottles (streaks) of yellow, but less distinct in lower part; moderate medium blocky structure.
- 36 to 42 inches (claypan), white friable heavy sandy clay loam; pale-yellow and pale-brown medium mottles in moderate numbers; moderate medium blocky structure.

Underlying material—
- 42 inches +, varicolored colluvial material of sand, silt, and clay.

The profile layers vary a little in thickness. In some areas the underlying material is composed partly of material weathered from granite or gneiss rock that lies in its original place.

The fertility of this soil is low. Runoff is slow to medium. Usually the hazard of erosion is slight to moderate. In places local wash accumulates on the surface. The surface soil is moderately to slowly permeable, and the subsoil is very slowly permeable. The moisture-holding capacity is moderately low.

On about 291 acres the soil is level or nearly level, and the slopes are 2 percent or less. These nearly level areas are included because of their relatively small extent and similar use suitability.

Use and management (Group B 4). More than half of Worsham sandy loam, undulating phase, is in forest. Some is in crops and pasture and a small percentage is idle. Corn is planted on small areas. Corn yields are usually very low under prevailing management but are affected by the amount of rainfall during the growing season.

This soil is fairly difficult to work, but it is easy to conserve. Mainly because of its poor workability and unfavorable drainage, the soil is poorly suited to tilled crops. Even with the establishment of adequate drainage, the soil would not be well suited to corn, wheat, oats, rye, and other crops common in the county. It is suitable, however, for pasture grasses in summer when moisture conditions are favorable. Satisfactory pasture can be grown if the management, including seeding, is good.

Worsham sandy loam, eroded undulating phase (2 to 6 percent slopes) (Wf).—This soil differs from Worsham sandy loam, undulating phase, principally in being moderately eroded. It has a very much smaller aggregate area.

The 3- to 9-inch surface soil is light brownish-gray loose sandy loam to pale-yellow or light yellowish-brown friable heavy sandy loam. It varies in color and texture according to the degree of erosion and the quantity of subsoil material mixed in the plow layer by tillage. The subsoil and underlying material are practically the same as in the respective layers of Worsham sandy loam, undulating phase.

This soil is low in fertility. Runoff is slow to medium, and the soil is only slightly to moderately susceptible to further erosion. In some places local sediment is accumulating on the surface. The moisture-holding capacity is moderately low.

Severely eroded areas totaling about 10 acres are included with this soil because of their small extent. Practically none of the surface layer remains on these areas, and heavy subsoil material is exposed in places.

Use and management (Group B–4).—Worsham sandy loam, eroded undulating phase, is mostly in forest, some of the acreage is in pasture and in crops, and a small acreage is idle. Corn is planted on small areas, but under common management the yields are usually very low. The soil is poorly suited to cultivation because of very slow internal drainage, poor workability, very low productivity, and other unfavorable characteristics. It can be used for pasture, especially in summer, as moisture conditions are favorable to pasture plants. Under proper management, including the use of a good seed mixture, satisfactory pasture can be obtained.

Worsham sandy loam, eroded rolling phase (6 to 12 percent slopes) (Wg).—This soil occupies comparatively strong slopes and has been moderately eroded. Otherwise it has practically the same profile characteristics as the undulating phase. It is very small in total acreage and is widely scattered over the county.

The surface soil is approximately 8 to 9 inches thick. It is light brownish-gray loose sandy loam to pale-yellow or light yellowish-brown friable heavy sandy

loam. It varies in color and texture according to the quantity of subsoil material mixed in by plowing. The subsoil, about 26 to 28 inches thick, consists of light-gray, streaked with yellow, heavy sandy clay. In the bottom 6 inches the subsoil is white heavy sandy clay loam mottled with pale yellow and weak brown. The underlying material is colluvial sand, silt, and clay that is somewhat variable in color. In some areas it is composed partly of decayed granite or gneiss that has not been moved from its original place.

The fertility of this soil is low. Runoff is medium to rapid, and the erosion hazard is moderate to high. The soil is moderately to slowly permeable in the surface soil and very slowly permeable in the subsoil. Its capacity for holding water is moderately low.

Use and management (Group B–4).—Most of Worsham sandy loam, eroded rolling phase, is in forest. Some is in pasture, and small parts are in crops or are idle. A few small areas are planted to corn, but yields usually are very low.

The soil is poorly suited to the crops commonly grown. Because of unfavorable drainage, workability, and productivity for tilled crops, it can be used best for pasture or forest. If the soil is properly managed, fairly good pasture can be grown, especially during summer when the moisture supply is best for pasture plants. In general, erosion hazard is greater than on the undulating phase, and careful consideration should be given to use and management.

Use, Management, and Yields

This section is divided into three parts. In the first part the soils are placed in 11 management groups, and the use and management[5] of each group is discussed. The second part explains how the soils are placed in 13 capability units within broad land-capability classes. The third part gives average yields that may be expected under ordinary management and those that may be expected under more intensive management.

Management groups

The physical character of land largely determines how it will be used, although other factors are important. In Fulton County physical characteristics have determined land use to various degrees but have not always been given adequate consideration. Consequently many areas have lost much of their fertility and organic-matter content, and erosion has been accelerated.

Misuse of the land can be judged by the extent of erosion. Almost half of the land in the county is moderately eroded, and about 5,600 acres are severely eroded. Most of the soils require medium or long rotations, yet large areas have been planted year after year to clean-cultivated crops—principally cotton and corn—or in a very short rotation without taking proper measures to maintain fertility or to control erosion.

Some soils now producing tilled crops are not suited to this use. Other soils now in pasture, or even in forest, have physical characteristics making them suitable for crops.

Specific recommendations for land use and soil management on individual farms should be made only after full consideration of the physical character of the land, of surrounding social and economic conditions, and of other conditions arising on the farm. Nevertheless, soil management can be discussed in a general way in relation to the physical character and management needs of the various soil types and phases.

The soils of Fulton County differ widely in management requirements. However, they can be placed in 11 management groups—the soils in each group having about the same management requirements. Each group is discussed separately, and some suggestions concerning management are made. The practices suggested for soils of all groups are those considered necessary to obtain crop yields listed in columns B of table 5.

MANAGEMENT GROUP A–1

PREDOMINANTLY SANDY SOILS ON ROLLING UPLANDS AND STREAM TERRACES

The soils of management group A–1 are moderately well drained to somewhat excessively drained. They range from moderately deep for the Lloyd soils to very deep for the Davidson soil. The soils are medium to low in productivity, and most of them are fairly easy or easy to work and conserve. They are moderately to highly susceptible to erosion, generally readily permeable, and low to medium in natural fertility. They are mostly medium or medium to strongly acid, but the Mecklenburg soil is slightly acid. These soils retain moisture and applied plant nutrients well, and their organic-matter content ranges from low to moderate.

The soils of management group A–1 are listed below. The estimated acreages cultivated, pastured, forested, and idle are given in table 4.

Cecil sandy loam, eroded rolling phase.
Cecil sandy loam, rolling phase.
Davidson clay loam, eroded rolling phase.
Hiwassee sandy loam, eroded rolling phase.
Lloyd sandy loam, eroded rolling phase.
Lloyd sandy loam, rolling phase.
Lockhart-Cecil sandy loams, eroded rolling phases.
Madison fine sandy loam, eroded rolling phase.
Madison fine sandy loam, rolling phase.
Madison gravelly sandy loam, eroded rolling phase.
Madison gravelly sandy loam, rolling phase.
Mecklenburg gravelly sandy loam, eroded rolling phase.

Use and management.—The soils of management group A–1 are used largely for crop production. The farmers getting the best yields use fairly long rotations consisting of corn, cotton, a small grain, and lespedeza, and they add lime and fertilizer in reasonably heavy quantities. Many farmers do not rotate crops, but they grow corn and cotton in alternate

[5] Soil use refers to the broad uses into which soils can be placed: (1) crops requiring tillage, (2) permanent pasture, and (3) forest. Soil management refers to such practices as selection and rotation of crops; application of lime, commercial fertilizers, manure, and crop residues; tillage practices; and engineering measures for controlling water on the land

years. Under common management average corn yields range from 10 to 20 bushels an acre, depending on the soil, but under good management average yields range from 30 to 40 bushels. The response of other crops to good management is somewhat similar to that of corn.

The soils of this management group are suited to all crops commonly grown in the county. The main management problems are erosion control and the increase and maintenance of fertility. Good practices to use for controlling erosion include contour tillage, terracing, and stripcropping.

For all soils of group A–1 except that of the Davidson series, the range of moisture content suitable for cultivation is moderate. For the Davidson soil, the range is relatively narrow, and the soil tends to become cloddy if cultivated when too wet or too dry. Cotton is reported to be more subject to boll-weevil infestation on this soil than on the other soils of the group.

The soils of group A–1 are well suited to pasture. If they are kept fertile, they will support a good growth of bermudagrass, orchardgrass, Dallisgrass, tall fescue, ryegrass; white, Ladino, crimson, and hop clovers; and lespedeza. In general, phosphorus and lime are the chief soil amendments needed. Nitrogen is needed for all grasses.

Good management for established pastures includes adequate fertilization, proper grazing, protection from erosion, and mowing to control weeds (*1*). Generally such pastures should receive substantial applications of phosphorus and potassium at intervals of 2 or 3 years, and nitrogen once or twice a year. Lime is also needed (*2*). Pasture areas deficient in potassium, especially those that have been cropped for a long time without adequate fertilization, respond well to treatment with potash fertilizer. In areas where it is desirable to establish pasture plants quickly, fertilizers should be added at the time of seeding.

MANAGEMENT GROUP A–2

PREDOMINANTLY REDDISH SANDY SOILS ON SMOOTH UPLANDS, STREAM TERRACES, AND COLLUVIAL SLOPES

The soils of group A–2 are on slopes that are favorable to cultivation. For the most part, they have good to somewhat excessive drainage. Depths range from moderately deep for the Lloyd soil to very deep for the Davidson. The soils are easy or very easy to work and, for the most part, easily or very easily conserved. The erosion hazard ranges from none to moderate. Productivity for the group ranges from low to high. The soils are easily permeable to roots, moisture, and air. Most of them have moderate moisture-holding capacity, retain applied plant nutrients well, and are medium to strongly acid. All respond well to good management.

The soils of management group A–2 are listed below. The estimated acreages cultivated, pastured, forested, and idle are given in table 4.

Cecil sandy loam, eroded undulating phase.
Cecil sandy loam, undulating phase.
Davidson clay loam, eroded undulating phase.
Hiwassee sandy loam, eroded undulating phase.
Lloyd sandy loam, eroded undulating phase.
Lockhart-Cecil sandy loams, eroded undulating phases.
Madison fine sandy loam, eroded undulating phase.
Molena loamy sand, light colored variant.
Starr loam, level phase.
Starr loam, undulating phase.
Wickham fine sandy loam, eroded undulating phase.
Wickham fine sandy loam, undulating phase.

Use and management.—The soils in management group A–2 are used largely for crops and pasture. All the major crops in the county are grown, and on the better farms fertilization is about the same as for soils of group A–1. Farmers, however, tend to use shorter rotations on the soils of group A–2 and to alternate clean-cultivated crops instead of using systematic crop rotations.

The principal management problems on soils of group A–2 are the building up and maintaining of soil fertility. Erosion is easier to control on these soils than on those of group A 1. The soils of group A–2 are suitable for all the crops grown in the county, as well as for pasture. They can be used fairly intensively. When they are kept highly fertile, they need only a short rotation. In many places, however, a 4- to 6-year rotation in which a legume hay crop is grown for a longer time can be used to better advantage.

Except for the Davidson soil, all the soils of this group can be satisfactorily worked over a relatively wide range of moisture content. The Davidson soil has a narrower moisture range satisfactory for cultivation and tends to clod easily if worked when too wet or too dry. Save for the exceptions stated, the management requirement for crops and pasture on this group are essentially the same as for group A–1.

MANAGEMENT GROUP A–3

PREDOMINANTLY GRAYISH SOILS ON SMOOTH UPLANDS, STREAM TERRACES, AND COLLUVIAL SLOPES

Management group A–3 contains well drained to moderately well drained soils. The soils occupy level to undulating areas well suited to tillage. For the most part the soils are deep and are easily to fairly easily permeable. They are relatively easy to conserve and have medium to low productivity. For the most part they are medium to strongly acid. They have moderate moisture-holding capacity and retain applied plant nutrients fairly well. The surface soil is highly leached, and its organic-matter content usually is low. All the soils have a lower potassium content than the red soils of the county that have formed from residual material from rocks high in mica and feldspar.

The soils in management group A–3 are listed below. The estimated acreages cultivated, pastured, forested, and idle are given in table 4.

Altavista fine sandy loam, level phase.
Altavista fine sandy loam, undulating phase.
Appling sandy loam, eroded undulating phase.
Appling sandy loam, undulating phase.
Grover fine sandy loam, eroded undulating phase.
Seneca fine sandy loam, level phase.
Seneca fine sandy loam, undulating phase.

Use and management.—Most of the soils in management group A–3 are cultivated or in pasture. All the important crops common to the county are grown. In general, yields are relatively low, yet heavily fertilized areas have produced yields that are comparable

to those on the red soils. The crops, rotations, and fertilization are about the same as for group A–1 soils. However, farmers tend to use shorter rotations on the soils of this group. Also, more of them use these soils for cultivated crops year after year than the soils having greater slope.

Good management practices for the soils of group A–3 are mainly those that will build up and maintain fertility. The soils are suitable for all crops grown in this area and for pasture. Where fertility is kept high, short rotations can be used satisfactorily. The soils, however, are low in organic matter, and rotations in which legume hay crops are grown for a longer time may be more desirable. These soils respond well to applications of potassium. The moisture range in which they can be cultivated satisfactorily is wide.

The Seneca soils generally occur in small areas, and they are used and managed in the same way as larger areas of adjacent soils. These soils are suited to all crops commonly grown, but home gardens, truck crops, and sorghum for sirup are grown to a large extent.

Except as stated above, the soils of group A–3 have essentially the same management requirements for crops and pasture as those in group A–1.

MANAGEMENT GROUP A–4

GRAYISH SANDY SOILS ON ROLLING OR MODERATELY SLOPING UPLANDS AND STREAM TERRACES

Management group A–4 consists of moderately well to somewhat excessively drained soils in areas having slope gradients of 7 to 10 percent. The soils are deep and have good to fair workability and fair conservability. The erosion hazard is moderate to high. These soils have medium to low productivity and a medium range of use suitability. Permeability is moderate to rapid, the moisture-holding capacity is moderate, and natural fertility is low. Organic-matter content ranges from low to moderate, and the reaction from medium to strongly acid. These soils retain plant nutrients fairly well, but probably not as well as the soils of group A–1. They are more fully leached in the surface soil than the red, heavy-textured soils of the county.

The soils of management group A–4 are listed below. The estimated acreages cultivated, pastured, forested, and idle are given in table 4.

Altavista fine sandy loam, eroded rolling phase.
Appling sandy loam, eroded rolling phase.
Appling sandy loam, rolling phase.

Use and management.—The soils in management group A–4 are used chiefly for crops and pasture. Management problems are principally the control of erosion and restoring and maintaining soil fertility. The soils can be worked within a relatively wide range of moisture content and are easy to cultivate. Cotton is reported to mature earlier on these soils than on red heavier soils of the county.

Crops and pasture have essentially the same management requirements on soils of this group as on soils of group A–1. More intensive water-control methods are needed on the soils of group A–4, however, because of their stronger slopes and greater susceptibility to erosion.

MANAGEMENT GROUP A–5

BROWNISH TO GRAYISH FRIABLE FERTILE SOILS OF FIRST BOTTOMS

The soils in management group A–5 are deep and well drained but are subject to periodic overflow by streams. They are level to nearly level and fairly easily to easily worked and easily conserved. They respond well to good management. They are not subject to ordinary erosion, although some stream erosion may occur in places. These soils are readily permeable to plant roots, moisture, and air; they have a very high moisture-holding capacity and range from medium to strongly acid. The soils of this group are medium to very high in fertility. They are capable of retaining applied plant nutrients well and usually have a moderate supply of organic matter.

The soils of management group A–5 are listed below. The estimated acreages cultivated, pastured, forested, and idle are given in table 4.

Congaree fine sandy loam.
Congaree silt loam.
Mixed alluvium, well drained.

Use and management.—A large part of the Congaree soils in this management group is cultivated. A smaller part of Mixed alluvium, well drained, is cultivated, and a greater part is pastured, idle, and forested. Corn is the principal crop. Yields depend largely on fertilization and on rainfall during crop growth; they range from 15 to 50 bushels an acre. Most farmers plant corn year after year, but those getting better results grow corn in short rotations with hay crops or interplant corn with peas or beans. Hay yields usually are fairly good, but some hay crops may bed down and be difficult to cure. Nitrogen fertilizer is commonly used for corn, and some farmers use complete fertilizer.

This group of soils is physically better suited to intensive use than any other group in the county. Except for occasional damage by floods, cultivated crops can be grown successfully year after year. Under proper fertilization, a short rotation of corn and legumes will generally maintain fertility, as the legumes supply nitrogen and organic matter. The soils are well suited to corn, hay, and truck crops. Small-grain crops also can be grown, but they make so much growth that their harvest is difficult. Corn responds to complete fertilizer, and consistently high yields of legumes require phosphorus and lime.

The soils of group A–5 are well suited to pasture, but growth tends to decline earlier in the dry periods of summer on Congaree fine sandy loam than on the other soils of the group. Bermudagrass, Dallisgrass, fescue, Ladino clover, whiteclover, and lespedeza make a good stand of excellent quality pasture that can be maintained throughout most of the grazing period.

Experiments and soil tests indicate that pasture responds well to lime, phosphorus, and potassium. Nitrogen, however, is needed on areas of low fertility and on pasture having a high percentage of grasses. Soil tests should be used as an aid in determining the quantity of lime and fertilizer to apply. Experiments and the experience of farmers indicate that 1,500 to 2,000 pounds of limestone and substantial amounts of phosphorus and potassium are beneficial. An application of a complete fertilizer, supplemented with

phosphorus and potassium at seeding, is of great value in establishing pasture. Supplemental applications of phosphorus and potassium as well as lime should be made periodically for pasture.

MANAGEMENT GROUP A–6
SOMEWHAT POORLY DRAINED BROWNISH TO GRAYISH SOILS ON FIRST BOTTOMS AND LOW STREAM TERRACES

Although the soils of management group A–6 are deep, the water table is moderately high in all except the Augusta soil. Productivity for the group ranges from low to high. Workability ranges from poor to good, and conservability from good to very good. All the soils except the Augusta are not affected by ordinary erosion but may be subject to stream scouring in places. The erosion hazard is only slight to moderate on the Augusta soil. Permeability of the soils of this management group to roots, moisture, and air is moderate in the upper part and slow in the lower. The natural fertility ranges from low in the Augusta soil to very high in the Chewacla soils. The reaction in all the soils is medium to strongly acid.

The soils of management group A–6 are listed below. The estimated acreages cultivated, pastured, forested, and idle are given in table 4.

Augusta fine sandy loam.
Chewacla fine sandy loam.
Chewacla silt loam.
Mixed alluvium, somewhat poorly drained.

Use and management.—A large part of the acreage of soils in management group A–6 is cultivated or in pasture. Corn and hay are the chief crops. Corn yields 10 to 45 bushels an acre, the actual yield depending largely on management practices and moisture conditions during the growing seasons. Hay yields for most of the soils are fairly good, but some hay may bed down and be difficult to cure. Corn is usually fertilized at planting time and sidedressed when about 40 days old.

Maintenance of fertility and providing adequate drainage are the main management problems on soils of this group. The range of suitability is restricted largely to row crops such as corn or soybeans and to certain legumes and grasses for hay and pasture. Small grains and alfalfa are not well suited. In general, only a short rotation of corn and legumes (the legumes for hay and green manure) and proper fertilization are required to maintain fertility. For corn fairly heavy applications of fertilizer at planting and nitrogen as a side dressing are usually necessary. These soils have favorable moisture relations during summer for corn, hay, and pasture, but all except the Augusta are subject to overflow by streams. Shallow open ditches provide adequate drainage in most places.

The favorable moisture conditions and general fertility of the soils in group A–6 make them well suited to pasture. Fertilizer needs for pasture on these soils are similar to those for pasture on soils of group A–5.

MANAGEMENT GROUP B–1
SEVERELY ERODED REDDISH SOILS ON ROLLING UPLANDS

Management group B–1 consists of well to somewhat excessively drained sandy clay loam and clay loam soils on fairly smooth interstream divides and moderate slopes leading to or toward drainageways. So much of the heavy subsoil of these soils has been exposed by erosion that infiltration of water is considerably slowed and the soils tend to dry out fairly readily. Workability of the group ranges from poor to fair, conservability from fair to poor, and productivity from low to very low. Fertility is low in all except the Lloyd soil, in which it is medium. Organic-matter content is low in all the soils, and the reaction is medium to strongly acid. These soils are moderately to highly susceptible to further erosion.

The soils of management group B–1 are listed below. The estimated acreages cultivated, pastured, forested, and idle are given in table 4.

Appling sandy clay loam, severely eroded rolling phase.
Cecil clay loam, severely eroded rolling phase.
Lloyd clay loam, severely eroded rolling phase.
Lockhart-Cecil clay loams, severely eroded rolling phases.
Madison clay loam, severely eroded rolling phase.

Use and management.—Only a small part of the soils of group B–1 is used for crops or pasture. The cropped areas are used chiefly for lespedeza or other hay crops, but yields are low. Little fertilizer is applied to these severely eroded and slightly droughty soils. The pasture is mostly unimproved. Broomsedge and a little bermudagrass and lespedeza are the usual pasture plants, and the carrying capacity and grazing value of the pasture are low.

Because of severe erosion, poor physical condition, droughtiness, and low fertility, the soils of this group are for the most part suitable only for deep-rooted legumes and trees. When the soils must be used for crops, long rotations having a maximum of legume hay crops should be used. The moisture range in which the soils can be cultivated satisfactorily is narrow. Pasture management of these soils, except for more intensive erosion control methods, is essentially the same as for the soils in group A–1.

MANAGEMENT GROUP B–2
GRAY OR BROWN SOILS OF LOW FIRST BOTTOMS SUBJECT TO PERIODIC OVERFLOW

The soils of management group B–2 are periodically subject to stream overflow. They have very poor to poor workability, very good to good conservability, and low to very low productivity. Runoff is slow to very slow. Fertility is medium to high, and the reaction is medium to strongly acid. The organic-matter content is usually moderate.

The soils of management group B–2 are listed below. The estimated acreages cultivated, pastured, forested, and idle are given in table 4.

Mixed alluvium, poorly drained.
Wehadkee fine sandy loam.
Wehadkee silt loam.

Use and management.—A large part of the acreage of the soils of management group B–2 is in forest, principally willow, alder, and blackgum. There is an undergrowth of reeds and coarse marshgrasses in places. Some of the better drained areas have been cleared and are used for summer pasture. Where the soils are used for corn and hay, the yields are low and crop failure is frequent.

Use of the soils of this group is restricted by a high water table that at times rises almost to the surface. Largely because of their low-lying position on first bottoms, they are difficult to drain adequately. The better drained areas and those areas where drainage is practical are suitable for pasture. The grazing value of the soils varies widely. Nevertheless, pasture can be expected to give moderate response to applications of lime and fertilizer.

MANAGEMENT GROUP B–3
GRAYISH TO REDDISH HILLY SOILS OF UPLANDS

The soils of management group B–3 are somewhat excessively drained. Most of them are deep, but they range from shallow to very deep. These soils are difficult to work. Their conservability is poor to fair, and their productivity low to very low. They are highly susceptible to erosion. They are readily permeable, but most of them are low in natural fertility. Their supply of organic matter is low, and the reaction is medium to strongly acid. Plant nutrients are retained well to very well, but not so well as in rolling phases of the same soil types, which are represented in other groups. Moisture relations usually are favorable to plant growth. In areas not protected by a plant cover, however, much rainwater is lost through heavy runoff, and consequently the soils tend to dry out readily.

The soils of management group B–3 are listed below. The estimated acreages cultivated, pastured, forested, and idle are given in table 4.

Appling sandy loam, eroded hilly phase.
Appling sandy loam, hilly phase.
Cecil sandy loam, eroded hilly phase.
Cecil sandy loam, hilly phase.
Davidson clay loam, eroded hilly phase.
Grover fine sandy loam, eroded hilly phase.
Lloyd sandy loam, eroded hilly phase.
Lloyd sandy loam, hilly phase.
Lockhart-Cecil sandy loams, eroded hilly phases.
Lockhart-Cecil sandy loams, hilly phases.
Madison fine sandy loam, eroded hilly phase.
Madison fine sandy loam, hilly phase.
Madison Grover-Louisa gravelly sandy loams, eroded hilly phases.
Madison-Grover-Louisa gravelly sandy loams, hilly phases.

Use and management.—About half the acreage of management group B–3 is in forest. Other areas are cultivated or in pasture. More than 8,000 acres are idle. The cultivated land is usually on slopes not suitable for tillage. Most of the cultivated areas are terraced, and the best yields are from long rotations having a minimum of row crops. Pastures consist principally of bermudagrass, lespedeza, and broomsedge. Idle land is covered with broomsedge and pine. The forest stand is a mixture of hardwoods with pines or second-growth pines. Many areas were cut over or so severely burned that considerable erosion occurred before a plant cover was reestablished.

Adequate erosion control and the building up and maintenance of fertility are needed for the soils in group B–3. These soils are poorly suited to cultivated crops because of their strong slopes and fairly low fertility. Where the soils must be cropped, long rotations in which row crops are grown at infrequent intervals are advisable. Particular care must be taken to control runoff. All tillage operations should be performed on the contour; and if row crops are grown, terraces and stripcropping are needed to control runoff and erosion.

All soils in group B–3 are fairly well suited to pasture. Heavy fertilization is necessary, however, to obtain satisfactory growth and to maintain an adequate stand of desirable plants. Management requirements for crops and pasture, with the exceptions stated above, are essentially the same as for soils in group A–1.

MANAGEMENT GROUP B–4
GRAY SANDY SOILS ON ROLLING UPLANDS AND GENTLE TO MODERATE COLLUVIAL SLOPES

The soils of group B–4 are somewhat poorly or poorly drained; they are characterized by a heavy claypan subsoil that causes slow or very slow internal drainage. These soils are moderately deep to deep and are easily permeable in the upper part but very slowly permeable in the lower part. They are fairly hard to work, easy to relatively difficult to conserve, and low to very low in productivity. Erosion hazard is slight to high, the moisture-holding capacity is moderately low to low, and the reaction is medium to strongly acid. The organic-matter content and natural fertility are low. The small areas in this group are widely distributed throughout the county. The Helena soil occurs on fairly smooth interstream divides and moderate slopes leading to or toward drainageways, whereas the Worsham soils occupy positions on foot slopes, around drainage heads, and along drainageways.

The soils of management group B–4 are listed below. The estimated acreages cultivated, pastured, forested, and idle are given in table 4.

Helena sandy loam, eroded rolling phase.
Worsham sandy loam, eroded rolling phase.
Worsham sandy loam, eroded undulating phase.
Worsham sandy loam, undulating phase.

Use and management.—Some of the better drained areas are planted to corn, although the soils of group B–4 are poorly suited or wholly unsuited to that crop. Pasture occupies about one-fifth the area of this group, but under the management commonly practiced the yields are usually low. Under good management, however, pasture is the best use for these soils. The requirements are about the same as those for pasture on the soils of group A–1.

MANAGEMENT GROUP C–1
PREDOMINANTLY HILLY AND STEEP SOILS OF UPLANDS, AND MISCELLANEOUS LAND TYPES

The soils and miscellaneous land types of management group C–1 range from shallow to deep. Their profile characteristics and parent material also vary. They are mostly somewhat poorly drained to excessively drained, difficult to very difficult to work and conserve, and very low to low in productivity. The hazard of erosion is mostly high to very high. For the most part, the soils are readily permeable and have moderate to very low moisture-holding capacities. They are mostly low to very low in fertility, although fertility is medium in some.

The soils of management group C–1 are listed below. The estimated acreages cultivated, pastured, forested, and idle are given in table 4.

Appling sandy clay loam, severely eroded hilly phase.
Appling sandy loam, steep phase.
Buncombe loamy fine sand.
Cecil clay loam, severely eroded hilly phase.
Cecil clay loam, severely eroded steep phase.
Cecil sandy loam, eroded steep phase.
Cecil sandy loam, steep phase.
Gullied land.
Hiwassee-Louisa soils, eroded hilly phases
Iredell stony clay loam, rolling phase.
Lloyd clay loam, eroded steep phase.
Lloyd clay loam, severely eroded hilly phase.
Lloyd gravelly sandy loam, eroded steep shallow phase.
Lloyd sandy loam, steep phase.
Lockhart-Cecil clay loams, severely eroded hilly phases.
Lockhart-Cecil clay loams, severely eroded steep phases.
Lockhart-Cecil sandy loams, eroded steep phases.
Lockhart-Cecil sandy loams, steep phases.
Louisa fine sandy loam, eroded hilly phase.
Louisa fine sandy loam, eroded steep phase.
Louisa fine sandy loam, rolling phase.
Louisa fine sandy loam, steep phase.
Louisburg sandy loam, hilly phase.
Louisburg sandy loam, rolling phase.
Louisburg sandy loam, steep phase.
Made land.[1]
Madison clay loam, severely eroded hilly phase.
Madison fine sandy loam, steep phase.
Madison-Grover-Louisa gravelly clay loams, severely eroded hilly phases.
Madison-Grover-Louisa gravelly sandy loams, steep phases.
Mecklenburg gravelly clay loam, eroded hilly phase.
Molena loamy sand, eroded undulating phase.
Riverwash.
Stony land, hilly
Stony land, rolling.
Stony land, steep.
Unclassified city land.[2]

[1] Made land was made for special purposes and should be considered as an exception to the use specified for the group.
[2] Unclassified city land has uses that are primarily urban and should be considered an exception to this group.

Use and management.—A large part of the area of the soils in group C–1 is covered with second-growth pine or a mixture of hardwoods and pines. Many of the eroded areas were once cultivated or used for pasture and then abandoned and allowed to revert to trees. Other forested tracts were cut over or severely burned, and the soils became eroded before a new forest growth could establish itself. A few areas of these soils are used for crops or pasture, but the yields are low.

Such unfavorable characteristics as steepness, severe erosion, unfavorable drainage, stoniness, and lack of fertility make the soils of this management group unsuitable for crops and pasture. Consequently, the soils in group C–1 are best suited to forest, although they vary greatly in suitability.

The forest sites in Fulton County range from the 60-foot class to the 80-foot class. The better sites are near Atlanta and along the Chattahoochee River in the southern part of the county. (*4*). For information on forest management, see the section, Woodland Management.

Land-capability classification

The capability grouping is an arrangement of soils made to show suitability for crops, grazing, forestry, wildlife, or other uses, and the risks of erosion or of other damage. It is widely used in helping farmers plan their practices for soil and water conservation.

Eight broad classes are provided in the capability arrangement. Each soil is placed in one of these broad classes after joint study by several persons of the ways it responds when it is used.

Soils that are easy to farm and are good for many uses are placed in capability class I. Such soils are not subject to more than slight erosion, drought, wetness, or other limitations and are at least fairly fertile. The farmer can use his class I soils for crops without special practices other than those needed for good farming anywhere. He can choose one of several cropping patterns, or if he wishes he may use the soil for pasture or trees or for other purposes.

Soils are placed in class II if they are a little less widely adaptable and thus more limited than those in class I. For example, a gently sloping soil may have a slight erosion hazard that requires contour farming or other practices to control runoff. Other soils may be placed in class II because they are too droughty, too wet, or too shallow to be in class I. Climate can also be a limiting factor if too cool or too dry, but is not a limiting factor in the capability grouping for Fulton County.

Class III contains the soils that are suitable for regular cropping but have more stringent management requirements than those in class II. The soils that are even more limited and have more narrow crop adaptations than those in class III but are suitable for tillage part of the time, or with special precautions, are placed in class IV.

Soils not suitable for cultivation, or on which cultivation is not advisable, are in classes V, VI, VII, or VIII.

Class V consists of soils unsuited to cultivation because of stoniness, standing water, or frequency of overflow. Class VI contains the soils that are steep, droughty, or shallow but will produce fairly good amounts of forage, orchard, or forest products. As a rule class VI soils should not be cultivated, but some can be disturbed with safety to prepare them for planting trees or seeding long-producing forage crops.

Soils in class VII are more limited than those in class VI, require more care in handling, and usually give only fair to poor yields of forage or wood products. Class VIII consists of soils so severely limited that they produce little useful vegetation. They may provide attractive scenery or may be parts of valuable watersheds. Some provide shelter for wildlife.

Subclasses: Although the soils within a single capability class present use and management problems of about the same degree, the kinds of problems may differ greatly. These problems and limitations may be caused by erosion, designated by the symbol (e), excess water (w), and shallowness, droughtiness, or low fertility (s).

CAPABILITY CLASSES AND SUBCLASSES IN FULTON COUNTY

Capability classes and subclasses in Fulton County are given in the following list. The brief description

of each subclass gives the general nature of most, but not necessarily all, of the soils included.

Class I.—Soils that are easy to farm and have no more than slight limitations in use. They can be used for intensive cultivation without special measures to control excess water or erosion, and they may be expected to produce high yields with good soil and crop management. No subclasses of class I are used.

Class II.—Soils that can be used for tilled crops with only slight risks of erosion or other limitations.
- IIe: Undulating soils subject to erosion.
- IIs: Light colored sandy soils that are slightly droughty.
- IIw: Bottom-land soils subject to occasional overflow.

Class III.—Soils that can be used for tilled crops but under moderate risk of erosion, excess water, or other limitations.
- IIIe: Rolling soils subject to erosion.
- IIIw: Soils with moderate limitations because of excess water.

Class IV.—Soils that have severe limitations for cultivation and under that use require extreme care.
- IVe: Eroded rolling soils and hilly soils.
- IVs: Droughty sandy soils of low fertility.
- IVw: Soils that are poorly drained and subject to overflow.

Class V.—Soils best suited to permanent vegetation because of wetness, stoniness, or frequent overflow.
- Vw: Poorly drained soils that have low fertility.

Class VI.—Soils unsuited to cultivation because of erosion, stoniness, wetness, or other limitations. They may be seeded occasionally to pasture, or forage, or trees may be planted.
- VIe: Hilly and steep soils.

Class VII.—Soils too steep, too stony, too erodible, or too droughty for cultivation.
- VIIe: Steep soils and gullied land.

Class VIII.—Soils that are unsuited to commercial production of any vegetation; they may have value for wildlife or recreation.
- VIIIs: Riverwash.

A list follows showing the capability class and subclass in which the soils of Fulton County have been placed:

	Capability class and subclass
Altavista fine sandy loam:	
Level phase (As)	I.
Undulating phase (Ab)	IIe.
Eroded rolling phase (Ac)	IIIe.
Appling sandy clay loam:	
Severely eroded rolling phase (Ad)	IVe.
Severely eroded hilly phase (Ae)	VIe.
Appling sandy loam:	
Undulating phase (Af)	IIe.
Eroded undulating phase (Ag)	IIe.
Rolling phase (Ah)	IIIe.
Eroded rolling phase (Ak)	IIIe.
Hilly phase (Al)	IVe.
Eroded hilly phase (Am)	IVe.
Steep phase (An)	VIIe.
Augusta fine sandy loam (Ao)	IIIw.
Buncombe loamy fine sand (Bs)	IVs.
Cecil clay loam:	
Severely eroded rolling phase (Ca)	IVe.
Severely eroded hilly phase (Cb)	VIe.
Severely eroded steep phase (Cc)	VIIe.
Cecil sandy loam:	
Undulating phase (Cd)	IIe.
Eroded undulating phase (Ce)	IIe.
Rolling phase (Cf)	IIIe.
Eroded rolling phase (Cg)	IIIe.
Hilly phase (Ch)	IVe.
Eroded hilly phase (Ck)	IVe.
Steep phase (Cl)	VIe.
Eroded steep phase (Cm)	VIe.
Chewacla fine sandy loam (Cn)	IIIw.
Chewacla silt loam (Co)	IIIw.
Congaree fine sandy loam (Cp)	IIw.
Congaree silt loam (Cr)	IIw.
Davidson clay loam:	
Eroded undulating phase (Da)	IIe.
Eroded rolling phase (Db)	IIIe.
Eroded hilly phase (Dc)	IVe.
Grover fine sandy loam:	
Eroded undulating phase (Ga)	IIe.
Eroded hilly phase (Gb)	IVe.
Gullied land (Gc)	VIIe.
Helena sandy loam, eroded rolling phase (Ha)	IIIe.
Hiwassee sandy loam:	
Eroded undulating phase (Hb)	IIe.
Eroded rolling phase (Hc)	IIIe.
Hiwassee-Louisa soils, eroded hilly phases (Hd)	IVe.
Iredell stony clay loam, rolling phase (Ia)	VIe.
Lloyd clay loam:	
Severely eroded rolling phase (La)	IIIe.
Severely eroded hilly phase (Lb)	IVe.
Eroded steep phase (Lc)	VIe.
Lloyd gravelly sandy loam, eroded steep shallow phase (Ld)	VIe.
Lloyd sandy loam:	
Eroded undulating phase (Le)	IIe.
Rolling phase (Lf)	IIIe.
Eroded rolling phase (Lg)	IIIe.
Hilly phase (Lh)	IVe.
Eroded hilly phase (Lk)	IVe.
Steep phase (Lm)	VIe.
Lockhart-Cecil clay loams:	
Severely eroded rolling phases (Ln)	IVe.
Severely eroded hilly phases (Lo)	VIe.
Severely eroded steep phases (Lp)	VIIe.
Lockhart-Cecil sandy loams:	
Eroded undulating phases (Lr)	IIe.
Eroded rolling phases (Ls)	IIIe.
Hilly phases (Lt)	IVe.
Eroded hilly phases (Lu)	IVe.
Steep phases (Lv)	VIe.
Eroded steep phases (Lw)	VIe.
Louisa fine sandy loam:	
Rolling phase (Lx)	IVe.
Eroded hilly phase (Lxs)	IVe.
Steep phase (Lxb)	VIe.
Eroded steep phase (Lxc)	VIe.
Louisburg sandy loam:	
Rolling phase (Ly)	IVe.
Hilly phase (Lya)	IVe.
Steep phase (Lyb)	VIe.
Made land (Ma)	——
Madison clay loam:	
Severely eroded rolling phase (Mb)	IVe.
Severely eroded hilly phase (Mc)	VIe.
Madison fine sandy loam:	
Eroded undulating phase (Md)	IIe.
Rolling phase (Me)	IIIe.
Eroded rolling phase (Mf)	IIIe.
Hilly phase (Mg)	IVe.
Eroded hilly phase (Mh)	IVe.
Steep phase (Mk)	VIe.
Madison gravelly sandy loam:	
Rolling phase (Ml)	IIIe.
Eroded rolling phase (Mm)	IIIe.

	Capability class and subclass
Madison-Grover-Louisa gravelly clay loams, severely eroded hilly phases (Ma)	VIe.
Madison-Grover-Louisa gravelly sandy loams:	
Hilly phases (Mc)	IVe.
Eroded hilly phases (Mp)	IVe.
Steep phases (Mr)	VIe.
Mecklenburg gravelly clay loam, eroded hilly phase (Ms)	IVe.
Mecklenburg gravelly sandy loam, eroded rolling phase (Mt)	IIIe.
Mixed alluvium:	
Well drained (Mu)	IIw.
Somewhat poorly drained (Mv)	IIIw.
Poorly drained (Mw)	IVw.
Molena loamy sand:	
Light colored variant (Mx)	IIs.
Eroded undulating phase (My)	IIIe.
Riverwash (Ro)	VIIIs.
Seneca fine sandy loam:	
Level phase (Sa)	I.
Undulating phase (Sb)	I.
Starr loam:	
Level phase (Sc)	I.
Undulating phase (Sd)	I.
Stony land:	
Rolling (Se)	VIIe.
Hilly (Sf)	VIIe.
Steep (Sg)	VIIe.
Unclassified city land (Ua)	----
Wehadkee fine sandy loam (Wa)	IVw.
Wehadkee silt loam (Wb)	IVw.
Wickham fine sandy loam:	
Undulating phase (Wc)	IIe.
Eroded undulating phase (Wd)	IIe.
Worsham sandy loam:	
Undulating phase (We)	Vw.
Eroded undulating phase (Wf)	Vw.
Eroded rolling phase (Wg)	VIe.

Estimated yields

In table 5 are estimated long-term average yields of the principal crops to be expected on the soils of Fulton County under two levels of management.

The estimates for crops are based primarily on interviews with farmers, the county agricultural agent, and others who have had experience in the agriculture of the county. Estimates for pasture are based on data obtained for comparable soils in other parts of the Piedmont Plateau. Estimates for both crops and pasture may not apply directly to specific tracts of land for any particular year. Nevertheless, these estimates are as accurate as can be made without detailed and lengthy investigations, and they serve to bring out the relative productivity of the soils shown on the map. Crop yields over a long period of years furnish the best available summation of the associated factors affecting productivity and therefore are used where available.

In columns A of table 5 are average yields obtained under prevailing farming practices. These practices include a somewhat poorly defined plan of crop rotations, and moderate fertilization for cotton, but little fertilization for corn, small grains, legumes, and pasture. Tillage is done on the contour. The land is generally terraced, although the terraces are often improperly constructed.

In columns B are yields to be expected under management more intensive than that used for yields in columns A. Under such management fertilizer and lime are applied more often and in larger amounts, crops are carefully selected and rotated, and legumes and cover crops are included in the rotation to maintain and increase the content of organic matter and nitrogen. Where needed, careful tillage, contour farming, terracing, and stripcropping are practiced to control erosion and to maintain or increase productivity. Management for pasture consists chiefly of adequate fertilization and liming, but in some areas regulated grazing and clipping of undesirable plants may be practiced.

Present knowledge about good management for specific soils when planted to certain crops is limited, but some deficiencies of the soils are known and others are considered probable. On the basis of this knowledge, some of the practices needed are discussed in the section, Management Groups, which can be referred to for definition of the level of management required to get the yields given in columns B.

This report does not attempt to define the practical limit for increasing crop production, because too many variables are involved. To illustrate, different crops need different treatment on a given soil; likewise, a single crop planted on dissimilar soils may need different treatment. Moreover, each farmer can reach a level of management at which it is no longer profitable for him to produce higher yields by intensifying practices. On each farm this level depends on the soil and the crop, as well as on the other soils, crops, and enterprises on the farm; and on prices and many other factors.

Soil Associations

Soils that occur together in a characteristic pattern make up a soil association. An association may consist of only a few or of many soils. The soils may be similar or may be of many different types. Although closely associated geographically, the soils in an association may differ in their suitability for agricultural use.

A generalized map was made of the six soil associations in the county. Their boundaries are shown in the colored soil association map in the back of the report.

Soil association maps cannot provide sufficient information for the study of individual farms or for the planning of farm operations. Like other simplified or generalized maps, they serve best in giving a picture of the soils of the larger areas, as a community, county, or State. Soil association maps are useful in regional studies of agricultural production, forestry, and watershed protection.

The soil associations in Fulton County are as follows: (1) Congaree-Chewacla-Wickham, (2) Cecil-Lloyd-Appling, (3) Madison-Louisa, (4) Lloyd-Cecil-Madison, (5) Appling-Cecil, and (6) Cecil-Lockhart. The associations occur on first bottoms and low terraces near streams or tend to follow exposures of rock formations. The Congaree-Chewacla-Wickham association coincides with areas consisting largely of recent or moderately recent alluvial deposits along

TABLE 5.—*Average acre yields of principal crops to be expected over a period of years on the soils of Fulton County, Ga.*

Yields in columns A are those to be expected under prevailing management; those in columns B are to be expected under good management; absence of yield indicates that the crop is not grown or the soil is unsuited to its production]

Soil	Map symbol	Corn		Oats		Wheat		Lespedeza hay		Soybean hay		Cotton (lint)		Permanent pasture	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B
		Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Acres per animal unit* [1]	*Acres per animal unit* [1]
Altavista fine sandy loam:															
Eroded rolling phase	Ac	10	30	25	50	8	12	0 5	1.0	0.5	1.0	150	400	5.0	3.0
Level phase	Aa	15	40	30	50	10	20	5	1.0	.8	1.5	175	500	4.0	2.0
Undulating phase	Ab	15	40	30	50	10	20	5	1.0	.8	1.5	175	500	4 0	2 0
Appling sandy clay loam:															
Severely eroded hilly phase	Ae													6.5	4.0
Severely eroded rolling phase	Ad	5	10	(2)	(2)	(2)	(2)	.3	.5	.3	1 0	75	125	6.0	3.5
Appling sandy loam:															
Eroded hilly phase	Am	5	15	(2)	(2)	(2)	(2)	.4	.7	.3	1 0	100	150	6.5	4.0
Eroded rolling phase	Ak	15	30	20	40	8	12	8	1 0	5	1.0	150	400	6.2	3.8
Eroded undulating phase	Ag	15	35	25	50	8	12	.5	1 0	.5	1 3	175	500	5 8	3 5
Hilly phase	Af	5	10	(2)	(2)	(2)	(2)	.4	.7	.3	1.0	125	175	6.5	3.7
Rolling phase	Ah	15	35	25	50	8	12	.5	1 0	.5	1.0	175	500	6 2	3.7
Steep phase	An													6.8	4 5
Undulating phase	Af	15	40	30	50	10	20	.5	1.0	.5	1.3	175	500	5 8	3.5
Augusta fine sandy loam	Ao	15	35					.5	1 0	.5	1.0	175	500	5 5	3.1
Buncombe loamy fine sand [3]	Bu													6 0	4.0
Cecil clay loam:															
Severely eroded hilly phase	Cb													6 7	4.2
Severely eroded rolling phase	Ca	5	15	(2)	(2)	(2)	(2)	.3	.5	.3	1 0	100	150	5.3	3.5
Severely eroded steep phase	Cc													7 2	5.2
Cecil sandy loam:															
Eroded hilly phase	Ck	5	15	(2)	(2)	(2)	(2)	.3	.5	.5	1 3	75	125	6.5	3.9
Eroded rolling phase	Cg	10	30	20	50	8	12	6	1.3	5	1 3	150	400	5 8	3.5
Eroded steep phase	Cm													7 0	4 5
Eroded undulating phase	Ce	15	40	30	50	10	20	.8	1 3	.5	1 3	175	500	5 3	3.5
Hilly phase	Ch	5	20	(2)	(2)	(2)	(2)	.4	.8	.5	1.0	125	175	6 0	3.8
Rolling phase	Cl	15	35	25	60	10	15	.7	1 5	.5	1.3	175	500	5 5	2.8
Steep phase	Cl													6.8	4.2
Undulating phase	Cd	15	40	30	50	10	20	.8	1.3	.8	1.5	175	500	5 5	3.2
Chewacla fine sandy loam [3 4]	Cn	20	45					(2)	(2)	[5] 1 0	[5] 1 5			3.2	2.1
Chewacla silt loam [3 4]	Co	20	45					(2)	(2)	[5] 1.0	[5] 1 5			3.1	2 0
Congaree fine sandy loam [3 4]	Cp	20	50	(2)	(2)	(2)	(2)	(2)	(2)	[5] 1.3	[5] 2.0			2.9	1.9
Congaree silt loam [3 4]	Cr	20	50	(2)	(2)	(2)	(2)	(2)	(2)	[5] 1.3	[5] 2.0			2.8	1.8
Davidson clay loam:															
Eroded hilly phase	Dc	10	25	(2)	(2)	(2)	(2)	4	.7	.5	1.3	100	175	5.2	3.1
Eroded rolling phase	Db	15	35	25	55	10	20	.7	1.4	.8	1.5	175	500	4.8	2.5
Eroded undulating phase	Da	20	45	35	65	15	25	8	1 5	1 0	2 0	200	600	4.5	2.0
Grover fine sandy loam:															
Eroded hilly phase	Gb	5	20	(2)	(2)	(2)	(2)	.4	.7	.5	.8	100	150	6.5	4.0
Eroded undulating phase	Gg	15	40	30	50	10	20	8	1.3	.5	1.0	175	500	5.8	3.5
Gullied land	Gu														
Helena sandy loam, eroded rolling phase	Hg	10	20	10	25	6	10	4	.8	.3	.8	(2)	(2)	7 0	5.0
Hiwassee-Louisa soils, eroded hilly phases	Hd													6 8	4.2
Hiwassee sandy loam:															
Eroded rolling phase	Hc	15	35	25	55	8	12	.7	1.5	.8	1.5	175	400	5.7	3.5
Eroded undulating phase	Hb	20	45	35	65	15	25	8	1 5	1.0	2 0	200	600	5.2	3 2
Iredell stony clay loam, rolling phase	Ia									.5	1.0			6.5	4.0

Lloyd clay loam:															
Eroded steep phase	Lc													6.3	4.7
Severely eroded hilly phase	Lb													6.0	4.5
Severely eroded rolling phase	La	5	10	(2)	(2)	(2)	(2)	3	5	.5	1.0	75	125	4.8	3.3
Lloyd gravelly sandy loam, eroded steep shallow phase	Ld														
Lloyd sandy loam															
Eroded hilly phase	Lk	5	15	(2)	(2)	(2)	(2)	4	7	.5	1.0	100	150	5.2	3.6
Eroded rolling phase	Lg	15	35	25	60	8	15	6	1.3	.5	1.5	175	400	4.8	3.3
Eroded undulating phase	Le	15	40	30	50	10	20	8	1.3	.8	1.8	175	600	4.5	3.0
Hilly phase	Lh	5	20	(2)	(2)	(2)	(2)	4	8	.5	1.0	125	175	5.0	3.5
Rolling phase	Lf	20	40	30	65	10	20	7	1.5	.5	1.5	200	500	4.5	2.5
Steep phase	Lm													6.0	4.0
Lockhart-Cecil clay loams:															
Severely eroded hilly phases	Lo													7.0	5.0
Severely eroded rolling phases	Ln							3	5	.3	.8			5.7	4.0
Severely eroded steep phases	Lp														
Lockhart-Cecil sandy loams:															
Eroded hilly phases	Lu	5	15	(2)	(2)	(2)	(2)	4	7	.3	.8	75	150	6.7	4.5
Eroded rolling phases	Ls	10	30	20	50	8	12	6	1.3	.3	1.0	150	400	6.1	4.0
Eroded steep phases	Lw													7.0	4.8
Eroded undulating phases	Lr	15	40	30	50	10	20	8	1.3	.5	1.8	175	500	6.0	3.9
Hilly phases	Lt	5	20	(2)	(2)	(2)	(2)	4	8	.5	.8	100	175	6.3	4.3
Steep phases	Lv													7.0	4.5
Louisa fine sandy loam:															
Eroded hilly phase	Lxa													7.0	4.8
Eroded steep phase	Lxc														
Rolling phase	Lx													5.8	3.9
Steep phase	Lxb														
Louisburg sandy loam:															
Hilly phase	Lya													7.0	4.0
Rolling phase	Ly									3	8			7.0	4.0
Steep phase	Lyb														
Made land [6]	Ma														
Madison clay loam															
Severely eroded hilly phase	Mc													6.7	4.2
Severely eroded rolling phase	Mb	(2)	(2)	(2)	(2)	(2)	(2)	3	5	.3	1.0	(2)	(2)	5.3	3.6
Madison fine sandy loam:															
Eroded hilly phase	Mh	5	15	(2)	(2)	(2)	(2)	4	7	.3	1.0	75	150	6.5	4.0
Eroded rolling phase	Mf	15	30	20	50	8	12	.6	1.3	.5	1.3	150	400	5.5	3.5
Eroded undulating phase	Md	15	40	30	50	10	20	8	1.3	.8	1.8	175	600	5.1	3.1
Hilly phase	Mg	5	20	(2)	(2)	(2)	(2)	4	8	.5	1.0	100	175	6.2	3.8
Rolling phase	Me	15	35	25	60	12	20	7	1.5	.8	1.5	175	500	5.3	2.9
Steep phase	Mk													6.8	4.2
Madison gravelly sandy loam:															
Eroded rolling phase	Mm	15	30	20	50	8	12	6	1.3	.5	1.0	150	400	6.0	3.7
Rolling phase	Ml	15	35	25	60	8	15	7	1.5	.5	1.0	175	500	5.8	3.5
Madison-Grover Louisa gravelly clay loams, severely eroded hilly phases	Mn													7.0	4.8
Madison-Grover-Louisa gravelly sandy loams:															
Eroded hilly phases	Mp	5	15	(2)	(2)	(2)	(2)	4	7	.3	.8	75	150	6.8	4.5
Hilly phases	Mo	5	20	(2)	(2)	(2)	(2)	4	8	.3	.5	100	175	6.5	4.2
Steep phases	Mr													7.6	5.5
Mecklenburg gravelly clay loam, eroded hilly phase	Ms													6.5	4.5
Mecklenburg gravelly sandy loam, eroded rolling phase	Mt	10	30	20	45	8	12	6	1.3	.5	1.0	150	375	5.0	3.0
Mixed alluvium:															
Poorly drained [4]	Mw													5.0	3.0
Somewhat poorly drained [3] [4]	Mv	10	25					(2)	(2)					4.5	2.7
Well drained [3] [4]	Mu	15	40					(2)	(2)					4.2	2.5
Molena loamy sand:															
Eroded undulating phase	My	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	.3	.8	(2)	(2)	6.0	4.0
Light colored variant	Mx	10	30	20	45	8	12	.5	1.0	.5	1.0	150	375	5.5	3.8
Riverwash [3]	Ra														
Seneca fine sandy loam															
Level phase	Sa	15	40	30	50	10	20	8	1.3	.8	1.5	175	500	4.5	2.2
Undulating phase	Sb	15	40	30	50	10	20	8	1.3	.8	1.8	175	500	5.0	2.5

TABLE 5. — *Average acre yields of principal crops to be expected over a period of years on the soils of Fulton County, Ga.—Continued*

Soil	Map symbol	Corn		Oats		Wheat		Lespedeza hay		Soybean hay		Cotton (lint)		Permanent pasture	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B
		Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Tons	Tons	Tons	Tons	Lb.	Lb.	Acres per animal unit[1]	Acres per animal unit[1]
Starr loam:															
Level phase	Sc	20	45	35	65	15	30	1.0	1.5	1.0	2.3	250	500	3.2	2.0
Undulating phase	Sd	20	45	35	65	15	30	1.0	1.5	1.0	2.3	250	500	3.5	2.1
Stony land:															
Hilly	Sf													7.0	5.0
Rolling	Se													6.5	4.5
Steep	Sg														
Unclassified city land[7]	Uc														
Wehadkee fine sandy loam[3]	Wa													4.7	2.8
Wehadkee silt loam[3]	Wb													4.5	2.5
Wickham fine sandy loam:															
Eroded undulating phase	Wd	20	45	30	60	10	20	.8	1.3	.8	2.0	200	600	4.0	2.0
Undulating phase	Wc	20	45	30	60	(2)	(2)	1.0	1.5	1.0	2.0	200	600	4.0	2.0
Worsham sandy loam:															
Eroded rolling phase	Wg													6.0	3.5
Eroded undulating phase	Wf													5.8	3.2
Undulating phase	We													5.5	3.0

[1] Average number of acres required to furnish without injury to the pasture adequate grazing for 1 animal unit for the grazing season, assumed to be 215 days. An animal unit is equivalent to 1 mature cow, steer, or horse, 5 hogs, or 7 sheep or goats.

[2] Crop not commonly grown but soil considered physically suited for it, though less suitable than for crops for which ratings are given.

[3] Subject to overflow every 4 or 5 years.

[4] Stream overflow was not considered in estimating average yield for this soil.

[5] Crop may bed down and be difficult to cure

[6] Estimated yields are not given because the special uses for this miscellaneous land type are not agricultural.

[7] Estimated yields are not listed because the uses for Unclassified city land are primarily urban.

streams. The Cecil-Lloyd-Appling association follows areas of biotite gneiss, biotite schist, granite, and basic rock. The Madison-Louisa association is directly related to areas of mica schist and quartz mica schist. The Lloyd-Cecil-Madison association overlies basic rock, gneiss, granite, mica schist, and quartz mica schist. The Appling-Cecil association coincides with areas of granite, gneiss, and mica schist. The Cecil-Lockhart association follows areas of biotite gneiss, biotite schist, and porphyritic granite.

As shown on the soil association map, a part of Atlanta was not divided into soil associations. The part not divided amounts to about 14.2 percent of the county.

Congaree-Chewacla-Wickham

The Congaree-Chewacla-Wickham association covers about 11.5 percent of the county. It occurs in irregular and comparatively narrow strips on first bottoms and terraces along the Chattahoochee and Little Rivers and their tributaries. The relief is mostly level or nearly level, although some slopes are undulating.

Drainage is moderately good to good along the Chattahoochee River. Along the small streams, however, drainage is somewhat poor because sediment and undergrowth have clogged the stream channels and raised the water table. The natural fertility of the soils is moderate to high. The poorly drained Wehadkee soils occupy parts of the association and generally show mottling of different colors throughout their depth. Also in the association are well drained, somewhat poorly drained, and poorly drained areas of Mixed alluvium. Areas of Altavista, Augusta, Buncombe, Hiwassee, and Starr are minor components of this association.

Soils that are good to excellent for crops and pasture and those that are fair to good and good to very good for pasture make up the larger part of this association. The better drained areas can be farmed intensively, and their management requirements are reasonably simple. The poorly drained Wehadkee soils and poorly drained Mixed alluvium are very poor for crops but are fair to good for pasture. They are largely covered with forest or bushes and water-loving grasses.

Cecil-Lloyd-Appling

The Cecil-Lloyd-Appling soil association occupies about 28.6 percent of the county and has the largest total acreage of any association. It occurs chiefly on rolling and hilly uplands, although some areas along drainageways are steep and others on interstream ridges are undulating.

This soil association has a well-developed dendritic drainage system, and natural drainage ranges from good to excessive. The soils overlie areas of biotite gneiss, biotite schist, granite, and basic rock. The soils are deep to moderately deep, and their natural fertility is low to medium. Included as minor components are areas of Grover, Iredell, Mecklenburg, Seneca, and Worsham soils, as well as areas of rolling, hilly, and steep Stony land.

Soils of this association range from very poor to fair for crops and very poor to good for pasture. Some areas are so difficult to work or conserve that cultivation is not feasible under the prevailing systems of management. They are best suited to forest. A few soils are fair to good for crops and good to very good for pasture. They occur in undulating areas, mainly on ridgetops. Moderate to severe erosion is common on the soils of this association.

Much of this association has been cleared, but large areas, especially in the southern part of the county, are idle or in second-growth pine. The cultivated areas consist mainly of soils that are poor to fair for cultivated crops but fair to good for pasture. These soils generally occur on rolling areas that require careful management. Other soils in this association are very poor to poor for crops but fair to good for pasture. They occur mainly on hillsides and require good management to produce satisfactory pasture. Some soils of this association occur on steep slopes and are poor for crops and very poor to poor for pasture. They are best suited to forest.

General farms and dairy farms are typical on this association. Soil fertility should be improved, however, and erosion should be controlled if better yields are to be obtained.

Madison-Louisa

The Madison-Louisa soil association covers about 13.8 percent of the county. It occupies the most dissected uplands along the Chattahoochee and Little Rivers and some of their larger tributaries. Steep V-shaped valleys and sharp ridgetops characterize these uplands. The underlying rock is principally mica schist that has a high content of quartz in some areas.

The association has a thoroughly developed dendritic drainage system, and the soils are well drained to excessively drained. The natural fertility is generally low. A very small part of this association is occupied by Molena loamy sand, eroded undulating phase, and Molena loamy sand, light colored variant. These soils are sandy throughout their profile and occur on remnants of old high stream terraces.

On the Madison Louisa association about 90 percent of the land is in pine. Some hardwoods are scattered throughout the forest, especially on the steeper slopes. Considerable timber is cut annually. Some of the less sloping areas are cultivated, but yields are somewhat lower than on associations with more favorable slopes. Because of strong relief, shallow to moderately deep soils, and excessive drainage in places, this soil association should be kept in trees. All of the soils are very poor for crops and very poor to poor for pasture.

Lloyd-Cecil-Madison

The Lloyd-Cecil-Madison soil association occupies about 8.8 percent of the county. For the most part it

occurs on rolling to hilly uplands. In places, especially on ridgetops, the relief is undulating. The deep to moderately deep soils have formed over basic rock, gneiss, granite, mica schist, or quartz mica schist.

This association has a well-developed dendritic drainage pattern, and the soils generally are well to somewhat excessively drained. Fertility is low to medium. Other components of the association are soils of the Davidson, Mecklenburg, and Seneca series, but their total area is small.

Soils dominant in this association are generally very poor to fair for crops and fair to good for pasture. The association contains soils that have a low supply of plant nutrients and organic matter, strong slopes, shallow profiles, or inadequate natural drainage. One of these characteristics, or a combination of them, may limit the suitability of the soil for the tilled crops commonly grown in the county. None, however, is so adverse as to make the soils totally unsuited to cultivation. Other soils in this association are so difficult to work or to conserve, or both, that cultivation is not generally feasible, although each soil is sufficiently fertile and holds enough moisture to maintain a moderate cover of pasture plants.

The undulating areas in this association are moderately productive of most crops commonly grown. Some hilly areas, especially those that have been severely eroded, are very poor for crops and very poor to poor for pasture. Erosion is moderate on the soils of this association, although some severe erosion occurs.

This association is mostly in the northern part of the county, and many of the better farms are located on it. Most of the land has been cleared and is used for general farming and dairying. Truck crops are grown on a few areas.

Appling-Cecil

The Appling-Cecil association covers about 16 percent of the county. It is made up mainly of grayish sandy soil on rolling to hilly uplands in the central and southern parts of the county. One area occurs in the northern part near Alpharetta. Its deep soils are underlain by granite and gneiss having a high content of quartz, and in places by mica schist.

This association has a well-developed dendritic drainage system, and its soils are well to somewhat excessively drained. Soil fertility is low. Minor components of the association are areas of Helena, Louisburg, Seneca, and Worsham soils, and areas of rolling and hilly Stony land.

Soils that are poor to fair for crops and fair to good for pasture make up a large part of this association. Soils that are best suited to pasture under prevailing farm practices are also extensive. Other soils that are moderately productive of most crops commonly grown in the county occur on a small part of the association. These soils occur mainly on the smoother areas. Erosion is generally moderate on the soils of this association.

Most of this association has been cleared, but much of it is idle or covered with second-growth pine. Much of it is suitable for general farms and dairy farms.

Cecil-Lockhart

The Cecil-Lockhart soil association includes about 7.1 percent of the county. It occupies dominantly rolling to steep uplands in the central and southwestern parts. It has formed over areas of biotite gneiss, biotite schist, or porphyritic granite. Large feldspar and quartz particles are conspicuous and differentiate this association from others in which Cecil soils form a part.

The drainage pattern is part of a well-developed dendritic drainage system. Soil drainage is good to excessive in most places, although it is excessive in some steep areas. The soils are deep, but their natural fertility is low. A large part of this association has been cleared and cultivated, but much of the land is now idle or in second-growth pine.

Soils that are very poor to poor for crops and very poor to good for pasture are dominant in this association. Soils that are poor to fair for crops and fair to good for pasture are somewhat extensive. A small area occurs, mainly on smooth ridgetops, that is fair to good for crops and good to very good for pasture. Nearly all the soils of this association have been moderately to severely eroded, and consequently the control of erosion is one of the principal management problems.

About 50 percent of this association is best suited to forest; about 30 percent to crops; and the rest to pasture. General farms and dairy farms are common, and many areas are well suited to these uses.

Woodland Management

When the first settlers arrived, all of the area was timbered with oak-pine forest. The pioneers cleared the more fertile soils and the areas of most suitable topography for their farms and homes. In 1950 about 36 percent of the county was forested, usually on the hilly or steep lands not suited to agriculture. According to the 1950 census, 1,464 farms reported woodlots. The average size of the farm woodlot was slightly more than 47 acres.

Forest requires both soil and forest management. The relation between forest and the soil can be seen in the variations in the kinds of trees, the density of stand, and the degree of growth under different conditions of slope, erosion, and profile depth and development (*15, 16*). The amount of moisture that is seasonally available to the soil commonly determines the kind and the rate of growth that takes place on it. Dry sites are likely to support such trees as scrub, blackjack, and scarlet oaks, and pines. In moist sites, red and white oaks and yellow-poplar may also occur. Wet sites, or land that is waterlogged for part of the year, will likely support sycamores and willows. Some species will grow on many different sites, but the character of the site affects the rate of tree growth. Deep loose sandy areas where bedrock is nearer than 24 inches to the surface, or severely eroded areas, will in all probability be dry sites.

In planting trees the following should be considered:

1. The species the area will support.
2. The kind of product desired.

3. Whether the areas will reseed naturally from surrounding woods in a reasonable time.
4. Market value of the product.
5. The resistance to disease and insects of the trees planted.
6. Other related problems.

Because each area has its own problems, it is advisable to get the help of the county agricultural agent, the local representative of the Soil Conservation Service, or State forester before planting. In Fulton County loblolly pine is especially effective in reclaiming eroded land. It will grow better on poor land and is in greater demand for lumber than hardwoods.

The following management practices are needed for forested areas:

1. Maintenance of a full stand of desirable species.
2. Prevention of damage by fire, grazing livestock, and harvesting equipment.
3. Harvesting mature trees and replacing them by desirable species.

Morphology and Genesis of Soils

Soil is the product of forces of weathering and soil development acting on the parent material deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent materials; (2) the climate under which that material accumulated and has since existed; (3) the plant and animal life in and on the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of development have acted on the soil material (*13*).

Climate and vegetation change the parent material from an inert heterogeneous mass into a body that has a definite genetic morphology. The effects of these two factors on the parent material are accelerated, or retarded, to varying degrees by relief. Relief, in turn, affects runoff, the movement of water through the soil, the rate of natural erosion, the vegetation, and exposure to sun and wind.

The kind of parent material also affects the results of the forces of climate and vegetation. Parent material is important in determining internal soil conditions and the kinds of natural vegetation that grow on the soil.

Finally, time is a factor in the development of the soil into a body that is in equilibrium with its environment. The degree of such development depends not only upon time, but also on the rate at which the forces of climate and vegetation act, which, in turn, is affected by the relief and parent material.

Factors of Soil Formation

Parent material

The parent materials of the soils of Fulton County fall within two broad classes based on source: (1) Residual materials from rocks decomposed in place; and (2) transported materials, or material removed from its original position by gravity or water and deposited on upland slopes or near streams. Materials of the first class are related directly to the underlying rocks from which they were derived; those of the second class are related to the soils or rocks from which they were washed.

Igneous and metamorphic rocks have given rise to the residual material. The rocks differ considerably in chemical and mineralogical composition, and parent materials derived from them likewise differ. The geologic period in which the rocks formed is unknown, but it is generally regarded as the pre-Cambrian. The rocks are mainly biotite gneiss, biotite schist, porphyritic granite, porphyritic granite gneiss, granite gneiss, hornblende gneiss, quartzite, and Brevard schist. Biotite gneiss and biotite schist are the dominant rocks.

Many of the soil series closely coincide in distribution with areas of certain rocks. Soils of the Appling series are most commonly developed in areas where the underlying rocks are granite or granite gneiss of relatively high quartz and feldspar content. The Cecil soils commonly occur where biotite gneiss and biotite schist dominate. However, where these rocks are relatively high in mica, they give rise to the darker more friable Madison soils. Lockhart soils generally overlie porphyritic granite. Davidson, Mecklenburg, and Iredell soils have developed in areas of basic rock, such as hornblende gneiss, hornblende schist, or diorite. The Lloyd soils coincide with rock formations made up of a mixture of basic and acidic rocks. Where the underlying rock is quartz-mica schist or gneiss high in quartz, soils of the Grover series have developed.

The material giving rise to soils of first bottoms and stream terraces is alluvial and has been transported from areas underlain by several different kinds of rock. No direct relationship can be established between this material and the rocks of its origin. Soils that have formed from local colluvium and alluvium have characteristics, as color and texture, similar to those of the adjacent soils from which their material washed.

Porphyritic granite occurs northwest of Palmetto and in the vicinity of Ben Hill (*6*). It is coarse-textured and is composed largely of quartz and feldspar. Many large quartz and feldspar components are conspicuous in the rock. Exposures of granite gneiss are common throughout the county, but the larger areas are north of Alpharetta and adjacent to a belt of Brevard schist along the Chattahoochee River. Hornblende gneiss and hornblende schist occur in several locations in the county, largely south of Alpharetta, west of Roswell, and east of Hapeville. Quartzite occurs in narrow bands north of Peachtree Creek and east of Alpharetta.

The belt of Brevard schist follows the general course of the Chattahoochee River. It is part of a belt crossing the State and extending between Oconee County, S. C., and Randolph County, Ala. This schist exhibits considerable variety from place to place. In Fulton County it ranges from a shalelike rock to a schist composed of light-colored mica (probably altered muscovite), quartz, and feldspar. It occurs in a narrow belt, mostly in the steep part of the county along the Chattahoochee River, although some areas

are partly covered by the flood plain of the river. Peridotite, serpentine, and other ultrabasic rocks occur along the boundary of Fulton and De Kalb Counties, south of Atlanta.

Climate

Fulton County has relatively long warm summers, short mild winters, and moderately heavy rainfall. As moderately warm weather prevails during much of the year, and the soil is moist most of the time, chemical reactions are rapid. Soaking rains have caused the leaching from the soil of soluble materials, as bases; and also the transfer downward in the soil of less soluble materials and colloidal matter. The soil is frozen for only brief periods and to very shallow depths; the weathering and the translocation of insoluble materials is therefore intensified. Because of soil leaching, free carbonate of lime has not accumulated in the soil, although calcium is present in mineral components of many of the rocks.

The soils of Fulton County range from slightly acid to strongly acid. Analyses were made to determine the acidity of some of the major soils of the county. The tests were made by glass-electrode pH meter in the laboratory of the University of Georgia from samples taken at various depths. The pH determinations are as follows:

Soil type and sample number:

	Inches	*pH*
Cecil sandy loam:		
1	0–7	5.34
2	7–10	5.28
3	10–25	5.52
4	25–36	5.70
5	36+	5.56
Madison fine sandy loam:		
1	0–8	5.82
2	8–24	5.52
3	24–36	5.42
Lloyd sandy loam:		
1	0–8	5.50
2	8–24	5.56
3	24–40	5.70
Congaree fine sandy loam:		
1	0–13	5.58
2	13–25	6.14
3	25–45	5.92

The climatic conditions in Fulton County are those that generally give rise to Red-Yellow Podzolic soils (*12*) and Reddish-Brown Lateritic soils (*13*). As a result, these well-drained, well-developed soils have certain outstanding characteristics in common. They have differences, however, that apparently have been caused principally by parent material. These differences are important in determining the soil group to which some of the soils belong.

Plant and animal life

Higher plants, micro-organisms, earthworms, and other forms of life occur on and in the soil and contribute to its morphology. The nature of the changes that these organisms have brought about depends, among other things, on the kinds of life and the life processes peculiar to each.

The kinds of indigenous plants and animals are determined by climate and many other environmental factors. The influence of climate is the most apparent, though not always the most important, in determining the kinds of higher plants that grow on the well-developed, well-drained soils. In this indirect way climate greatly influences the morphology of soils. Climate and vegetation acting together, therefore, are the active factors of soil genesis.

Fulton County is in the oak-pine subdivision of the southern hardwood forest of the eastern forest region of the United States (*10*). Although oak and pine distinguish this forest belt from other forested areas, many other kinds of trees are present. The soils of the county formed under this predominantly oak-and-pine cover, but during the process only a small quantity of forest organic matter was incorporated with the soils. In the present forested areas, mainly steep land and stony land, a thin layer of forest litter and leaf mold covers the soil. A small quantity of organic matter, composed of decayed leaves, bark, and twigs, is mixed with the upper inch or so of the surface layer.

The trees native to Fulton County are moderately deep to deep feeders on plant nutrients in the soil. In this oak-pine region, only a part of the species shed their leaves annually. Although the leaves differ considerably among species in their supply of various plant nutrients, in general the quantities of bases and phosphorus returned to the soil by the leaves of deciduous trees are greater than those returned by the needles of coniferous trees. Essential plant nutrients are thus restored by leaves to the upper part of the soil from the lower part.

Organic matter from various plants is acted on by micro-organisms, earthworms, and other forms of life, and by direct chemical reactions. In this county such materials decompose rather rapidly because of favorable temperature and moisture conditions, favorable character of the organic material itself, and, presumably, favorable micropopulation of the soil. Furthermore, organic material does not accumulate on well-drained sites to the extent that it does in cooler regions under similar drainage conditions.

Little is known about the micro-organisms, earthworms, and other population in the soil, but their influence on soil formation is probably equal to that of higher forms of life.

The well-drained, well-developed soils of the county have formed under somewhat similar conditions of climate and vegetation. These factors have had a maximum of influence on these soils, and relief and age have had a minimum. As a result, soils developed from various kinds of parent materials have many properties that are common to all.

Relief

The relief ranges from almost level on first bottoms to steep or even broken in many places near streams. It modifies the effects of climate and vegetation on soil formation. On some strong slopes where the quantity of runoff is large, geologic erosion is rapid and almost keeps pace with rock weathering and soil formation. The amount of water that percolates

through the soil is small, and the extent of leaching and translocation of material is correspondingly small.

Age

Some soils have not been in place long enough to show the influence of climate and vegetation. Consequently they have not developed well defined and genetically related profile horizons. Most soils of the first bottoms and colluvial slopes are composed of such materials. Soils of steep slopes have their materials constantly replenished or removed by geologic erosion and do not develop genetically related horizons. These two broad groups comprise the young soils of the county.

Soils that have been in place for a long time and have approached equilibrium with their environment are considered mature or old. In some nearly level or undulating areas where internal drainage is slow and soil parent material has been in place for a long time, the soils have characteristics that well-drained soils do not have. Their subsoil may be mottled, and it may contain a very firm or very compact claypan. Geologic erosion usually is slow, and highly leached surface soil may be formed. Such soils are very old.

In Fulton County, the soils range in age from very young to very old but for the most part are old.

Classification of Soils

Soils are classified in several categories. The lowest three—phase, type, and series—are discussed in the section, Soil Survey Methods. Soil series may be grouped into higher categories. The highest is called the soil order. There are three soil orders—zonal, intrazonal, and azonal. Subdivisions within each order are called great soil groups.

Zonal soils are defined as any of the great groups of soils having well-developed soil characteristics that reflect the influence of the active factors of soil genesis —climate and living organisms, chiefly vegetation (*13*). In Fulton County the zonal soils are members of the Red-Yellow Podzolic and Reddish-Brown Lateritic (Latosols) great soil groups.

Intrazonal soils are any of the great groups of soils with more or less well-developed soil characteristics that reflect the dominating influence of some local factor of relief, parent material, or age over the normal effect of climate and vegetation. Each group of these soils may be found associated with two or more of the zonal groups (*13*). Intrazonal soils in this county are members of the Planosol great soil group.

Azonal soils are any group of soils without well-developed profile characteristics, owing to their youth or conditions of parent material or relief, that prevent the development of normal soil-profile characteristics (*13*). Azonal soils in this county belong to the Lithosols, Regosols, and Alluvial great soil groups.

Fulton County lies wholly within the Red-Yellow Podzolic soil region of the Eastern United States (*9*). The soil-forming processes show evidence of both podzolization and laterization. The surface soils are prevailingly sandy, and the subsoils are prevailingly clayey. In many areas of steep land, loose rock fragments are scattered over the surface and outcrops of bedrock are common.

In the taxonomic classification of soils, the normal profile serves as a basis for comparisons. In Fulton County this profile has a relatively light-colored surface soil, or A horizon, of coarse to fine texture; a uniformly colored, fine-textured, firm to friable subsoil, or B horizon; and a light-colored parent material layer, or C horizon, which is usually coarser textured than the B horizon and finer textured than the A horizon. In the A horizon the textures are mainly sandy loam and fine sandy loam and, to a less extent, silt loam and clay loam. The textures of the B horizons are prevailingly sandy clay loam and clay loam. In the C horizon the materials vary according to the character of the parent rock and degree of weathering. The texture may be sandy loam, sandy clay loam, or clay loam. The thickness of the horizons differs somewhat in different soils. That of the A horizon ranges from about 4 to 12 inches, and that of the B horizon, from about 12 to 36. The C horizon, which for the most part consists of decayed rock material, ranges in thickness from a few inches to many feet.

Normal, or mature, soil profiles have developed in most parts of the county on gentle to smooth interstream divides and stream terraces. Extremely well developed or postmature profiles usually occupy areas on interstream divides, foot slopes, and terraces. The areas commonly have mild or nearly level relief, shallow and less thorough stream dissection, and obstructed internal drainage. Poorly developed or young profiles are for the most part in areas of hilly, steep, or broken relief near drainageways and in first bottoms where new materials are left by floodwaters and drainage conditions are unfavorable.

In table 6 the soil series of Fulton County are classified by soil orders and great soil groups, and the relief, parent material, and degree of horizon differentiation are given for each. The classification is based principally on characteristics observable in the field, and further study may make modification necessary.

A convenient method of showing the relation of the soil series of the county to the great soil groups is by soil catenas. A soil catena is a group of soils, within one zonal region, that developed from similar parent material but have different characteristics in the solum because of differences in relief or drainage (*13*). Thus, Buncombe, Congaree, Chewacla, and Wehadkee comprise a catena of soils occurring over young alluvium. These soils differ greatly in physical characteristics, however, because of the different conditions of drainage under which each was formed and not because of any significant difference in the parent alluvium. Within every catena different great soil groups common to the region may be represented. For example, in this county Louisa, Madison, and Grover soils are in the same catena, although the Louisa soil is a Lithosol and Madison and Grover soils are Red-Yellow Podzolic soils. In table 3 the soils are arranged by catenas; the catenas are shown in horizontal lines following the parent material.

Theoretically, every catena in a region having uniform climate and vegetation has soils that represent all the great soil groups common to that region. In some

TABLE 6.—*Soil series of Fulton County, Ga. classified by higher categories and the relief, parent material, and degree of horizon differentiation of each*

Great soil group and series	Relief	Parent material	Degree of horizon differentiation
ZONAL SOILS			
Red-Yellow Podzolic:			
		Residuum from weathering of—	
Cecil	Undulating to steep	Gneiss or granite; mica schist in places	Very high.
Lockhart	Undulating to steep	Porphyritic granite	Very high.
Madison	Undulating to steep	Quartz mica schist	Very high.
Appling	Undulating to steep	Granite or gneiss; mica schist in places	High.
Grover	Undulating and hilly	Quartz mica schist, or gneiss having large content of mica.	High.
Wickham	Undulating	Alluvium of moderately recent origin	High.
Altavista	Level to rolling	Alluvium of moderately recent origin	Medium.
Reddish-Brown Lateritic (Latosols):			
		Residuum from weathering of—	
Davidson	Undulating to hilly	Basic rock, chiefly hornblende	High.
Lloyd	Undulating to steep	Basic rock mixed with granite, gneiss, or mica schist.	High.
Mecklenburg	Rolling to hilly	Basic rock, chiefly diorite	High.
Hiwassee	Undulating to hilly	Alluvium in place for a long time	High.
INTRAZONAL SOILS			
Planosols:			
		Residuum from weathering of—	
Helena	Rolling	Aplitic granite; diorite in places	Very high.
Iredell	Rolling	Basic rock, chiefly diorite	Very high.
Worsham	Undulating and rolling	Colluvium and alluvium of local origin derived mainly from Appling and Cecil soils.	Medium to high.
Augusta	Level to undulating	Alluvium of moderately recent origin	Medium to high.
AZONAL SOILS			
Lithosols:			
		Residuum from weathering of—	
Louisburg	Rolling to steep	Granite gneiss or gneiss	Very low.
Louisa	Rolling to steep	Mica schist or quartz mica schist	Low.
Regosols:			
Molena	Undulating	Alluvium in place for a long time	Very low.
Alluvial soils:			
		Colluvium and alluvium of local origin derived mainly from—	
Seneca	Level to undulating	Appling, Cecil, and Madison soils	Low.
Starr	Level to undulating	Lloyd, Davidson, Cecil, and Madison soils	Low.
Buncombe	Level to nearly level	Alluvium of recent origin; new material deposited periodically.	Very low.
Congaree	Level to nearly level	Alluvium of recent origin, new material deposited periodically.	Low to very low.
Chewacla	Level to nearly level	Alluvium of recent origin; new material deposited periodically.	Low.
Wehadkee	Level to nearly level	Alluvium of recent origin; new material deposited periodically.	Very low.

areas, however, uniform conditions of climate, vegetation, and parent material prevail, and the relief and drainage may be so uniform that only a few soils (or even only one soil) representing the great soil groups have developed. In such areas the catenas may be incomplete because all members either are not present or occur in unmappable patterns. In this county most catenas are incomplete.

Morphology of Soils by Great Soil Groups

Red-Yellow Podzolic soils

Red-Yellow Podzolic soils are a group of well-developed, well-drained acid soils having thin organic (A_0) and organic-mineral (A_1) horizons, over a light-colored bleached (A_2) horizon, over a red, yellowish-red, or yellow more clayey (B) horizon. Parent materials are all more or less siliceous. Coarse reticulate streaks or mottles of red, yellow, brown, and light gray are characteristic of deep horizons of Red-Yellow Podzolic soils where parent materials are thick (*12*).

Red-Yellow Podzolic soils have developed under deciduous, coniferous, or mixed forest in warm mesothermal to tropical, humid to perhumid climates. In cultivated areas the A_0 and A_1 horizons are incorporated in the plow layer, and in many places accelerated erosion has removed all or nearly all of the A horizon, and the B is exposed. The clay fraction is dominated by kaolinite but contains considerable free ferric oxides or hydroxides and, in places, a relatively small proportion of aluminum hydroxide. Hydrous mica and montmorillonite dilute the clay fraction in some of the soils but are not considered typical. In any specific parent material, the reticulate streaks generally occur higher in the profiles with yellow B horizons than in those with red B horizons. In a few members of the group, especially the very sandy ones, the streaked material may be absent. Other well-developed, well-drained red and yellow soils, without podzolic morphology, are associated with Red-Yellow Podzolic soils. Red-Yellow Podzolic soils were classified separately as Red Podzolic and Yellow Podzolic soils in Soils and Men (*13*).

In this county the Cecil, Lockhart, Madison, Wickham, Appling, Grover, and Altavista series have the common characteristics of Red-Yellow Podzolic soils. Although the soils may range somewhat in maturity within the series, all are old enough to have at least a moderately well developed Red-Yellow Podzolic profile. In this classification the Cecil, Lockhart, Madison, and Wickham series may be considered as representing the red members of the Red-Yellow Podzolic soils, and the Altavista series the yellow division. The Appling and Grover series may be considered as representing an intermediate color position between that of the red and yellow.

In Fulton County, Cecil sandy loam has developed a normal profile typical of the red soils of the Red-Yellow Podzolic group. A profile description follows of Cecil sandy loam, undulating phase, under an original forest cover of oak, hickory, and scattered pine in a well-drained area along Welcome All Road near Welcome All Church:

A_{00} 0 to 1 inch, forest litter consisting of leaves, twigs, and bark; some leaf mold.

A_1 1 to 1½ inches, dark-gray (10YR 4/1)[6] loose sandy loam; moderate content of well incorporated organic matter.

A_2 1½ to 8 inches, yellowish-brown (10YR 5/4) friable sandy loam; weak fine crumb structure; roots apparently penetrate with moderate ease.

A_3 8 to 11 inches, yellowish-red (5YR 5/8) friable heavy sandy loam; weak medium crumb structure.

B_1 11 to 27 inches, red (10R 4/8) firm clay; moderate medium-blocky structure; a few mica flakes.

B_2 27 to 38 inches, red (2.5YR 4/8) firm clay; moderate medium blocky structure; mica flakes more numerous than in horizon B_1.

B_3 38 to 50 inches, red (2.5YR 5/8) friable clay; brownish-yellow (10 YR 6/8) distinct coarse mottles in moderate numbers; weak medium crumb structure; considerable quantity of mica flakes and some decayed gneiss or quartz mica schist.

C 50 inches +, decomposed gneiss or quartz mica schist.

The Lockhart profile is similar to that of the Cecil but differs in the character of its parent material and in having many very coarse feldspar and quartz particles. The Madison profile also is similar to the Cecil in nearly all characteristics. It differs, however, in having a greater mica content and generally a more friable B horizon. The Wickham profile, formed from moderately young alluvium on low stream terraces, has a browner color in the A horizon than the Cecil and a reddish brown instead of red B horizon. The main differences between the Appling and Grover profiles and that of the Cecil profile is in the color of the B horizon—in the Appling, yellowish red and in the Grover, reddish yellow. The Grover profile is more micaceous than the Appling and has formed over rock usually having a much higher mica content. The Altavista profile has developed over moderately young alluvium on low stream terraces. It has a light olive-brown friable A horizon and an olive-brown firm B horizon. The B horizon is friable and coarsely mottled with light olive brown and red in the lower part.

Reddish-Brown Lateritic Soils (Latosols)

Reddish-Brown Lateritic soils are a zonal group of soils with dark reddish-brown granular surface soils, red friable clay B horizons, and red or reticulately mottled lateritic parent material; they developed under a humid tropical climate with wet-dry seasons and a tropical forest vegetation (*13*). Laterization, with little or no podzolization, has dominated in the development of these soils. Laterization is the process of silica removal, with consequent increase in the alumina and iron content and decrease in base-exchange capacity of the soil.

In Fulton County the Davidson, Lloyd, Mecklenburg, and Hiwassee series have the characteristics described for Reddish-Brown Lateritic soils (Latosols). These soils have developed from rock materials that, in general, are relatively high in bases and have been in place for a long time. The well-developed profile has a uniformly colored B horizon ranging from red to reddish brown, although some mottling usually appears in the B horizon of the Mecklenburg soil. The Davidson and Mecklenburg soils have formed over

[6] Figures in parentheses are Munsell color notations.

dark-colored basic rocks, the Lloyd soils over a mixture of basic and acidic rocks, and the Hiwassee soils over old high-terrace alluvium.

Davidson clay loam, eroded undulating phase, may be considered typical of the Reddish-Brown Lateritic soils in this county. A profile in a less eroded area has characteristics as follows:

- A_p 0 to 7 inches, dark reddish-brown (5YR 3/3) friable to firm clay loam of moderate medium crumb to fine blocky structure.
- B_2 7 to 45 inches, dark-red (2.5YR 3/6) firm clay having moderate medium to fine blocky structure; sticky when wet, hard when dry.
- B_{23} 45 to 57 inches, dark-red (2.5YR 3/6) friable clay loam having moderate fine blocky to weak coarse blocky structure.
- C 57 inches +, partly decayed dark basic rock mixed with yellow friable clay loam material.

The Davidson series has a counterpart in the Decatur series of the Valley and Ridge province of the Appalachian Highlands.

The Lloyd soils have formed in residuum derived from a mixture of acidic and basic rocks. In appearance and development they are about intermediate between the Davidson and Cecil soils. The A horizon is reddish brown and friable, and the B horizon is red and firm. The C horizon is detritus from basic rock mixed with that from granite, gneiss, or mica schist.

The Mecklenburg soils vary somewhat in color, consistence, and structure. Morphologically they are about intermediate between the Davidson soils and the Iredell soil (classified as Planosols). In some places profile development approaches that of the Davidson and in others that of the Iredell. The A horizon is grayish brown to reddish brown and friable. The subsoil is firm and is reddish brown, slightly mottled with brown and yellow. The C horizon, in most places, is light olive-yellow to olive, decayed diorite rock.

The Hiwassee soils are a counterpart of the Davidson soils, but they occupy positions on high stream terraces and have formed over alluvium that has lain in place for a long time. The A horizon is dark reddish brown and friable, and the B horizon is dark red and friable. The C horizon is reddish brown and friable and has a few yellow and gray medium mottles and a variable quantity of gravel.

Planosols

Planosols are an intrazonal group of soils with eluviated surface horizons underlain by B horizons more strongly illuviated, cemented, or compacted than those in associated normal soils; they developed on a nearly level upland surface under grass or forest vegetation in a humid or sub-humid climate. Podzolization and gleization are the main soil forming processes involved in their development. Characteristic of Planosols is a well-defined layer of clay or cemented material accumulated at various depths below the surface in nearly level areas having more or less restricted drainage (*13*).

In Fulton County the Helena, Iredell, Worsham, and Augusta series belong to this great soil group. The Helena and Iredell soils are on generally smooth uplands, the Worsham soils are on colluvial slopes, and the Augusta soil is on low stream terraces. In each of these soils there is a firm or very firm layer caused by the concentration of clay within the profile. This layer hinders or almost prevents percolation of water through the profile. The Helena soils have formed from residuum of aplitic granite mixed in places with residuum of diorite, and the Iredell soil has formed from residuum derived principally from diorite. The Worsham soils have developed mostly from local colluvium and alluvium (largely acidic), and the Augusta soil has developed over moderately young alluvium.

The cause for formation of claypans in the profiles of the Planosols in this county cannot be fully explained. In the Helena soils a partial cause may be the downward migration and subsequent concentration of the finer soil separates in the profile, but the main cause is probably the thorough decomposition of clay-forming minerals directly from the decaying parent rock. In the Iredell soil the clay layer doubtless is made up of thoroughly decomposed clay-forming minerals that came directly from decomposed parent rock. The heavy layer in the Worsham soils probably is the result of the translocation of fine soil separates by percolating waters. Obstruction of some sort at the bottom of the profile may have prevented further downward movement of these fine particles and caused their concentration. The claypan in the Augusta soil profile may be a dense layer, left from the original alluvium, that has not been changed much in composition by soil-forming processes. On the other hand, it may have been formed in the same way as the heavy layer of the Worsham soils.

Helena sandy loam, eroded rolling phase, is representative of the Planosol group. A description of a profile in a less eroded area follows:

- A_p 0 to 6 inches, light brownish-gray (2.5Y 6/2) friable sandy loam; very weak fine crumb structure.
- B_2 6 to 24 inches, yellow (2.5Y 8/6) very firm sandy clay; many brown and red mottles of moderate size; strong medium to coarse blocky structure; very plastic and sticky when wet, hard when dry.
- B_3 24 to 32 inches, light-gray (2.5Y 7/2), firm, heavy sandy clay loam; many conspicuous yellowish-brown to yellowish-red fine to medium mottles; strong medium to coarse blocky structure; plastic when wet, hard when dry.
- C 32 inches +, light-colored decomposed aplitic granite.

The Iredell soil differs from the Helena soil in color, but it has a heavy claypan B horizon. The A horizon of the Iredell soil is dark grayish brown and friable. The B horizon is light olive brown and very firm. The C horizon is detritus derived from diorite rock; its color varies and consists of shades of yellow, olive, gray, and brown. The profile is relatively shallow to bedrock.

The Worsham soils have developed from local colluvium and alluvium deposited on lower upland slopes and, in places, around drainage heads and along drainageways. These soils show the dominant influence of poor drainage caused by topographic position and seepage water from higher slopes. A heavy claypan layer is characteristic of the profile. The A horizon is light brownish gray and loose in the upper part. In the lower part, it is pale yellow, coarsely streaked or mottled with gray and brown, and friable. The B horizon in the upper part is light gray, coarsely streaked

with yellow, and it is heavy almost throughout. In the bottom part, it is white, moderately mottled with pale yellow and weak brown. In some areas residual material, in its original place, has contributed somewhat to soil formation.

The Augusta soil was formed on low stream terraces from moderately young alluvium. It is associated with the Red-Yellow Podzolic Altavista soils but differs from them in being somewhat poorly drained and in having a heavy claypan B horizon. The A horizon is light brownish gray and very friable. The upper part of the B horizon is light yellowish-brown firm fine sandy clay. The bottom part is light-gray, mottled with white and brownish-yellow, firm fine sandy clay.

Lithosols

Lithosols are an azonal group of soils having no clearly expressed soil morphology and consisting of a freshly and imperfectly weathered mass of rock fragments; they are largely confined to steeply sloping land (*13*).

In this county members of the Louisburg and Louisa series are classified as Lithosols. The soils of these two series occupy positions on uplands having very strong slopes and very narrow ridgetops. The slopes are rolling to steep; the smoother parts are on the ridge crests. The profiles are shallow, and little or no true B horizon has developed. Disintegrated bedrock lies at depths of about 18 to 28 inches. The two series differ chiefly on the basis of parent rock and mica content. The Louisburg soils have formed from material weathered from granite gneiss or granite and are practically free of mica. In contrast the Louisa soils have formed from residual products of mica schist or quartz mica schist and are conspicuously micaceous throughout the entire profile. Except in some Louisa areas, the natural drainage of both series is dominantly excessive.

Louisburg sandy loam, steep phase, is representative of the Lithosols in this county. In a forested area the profile is as follows:

1. 0 to 5 inches, grayish-brown (10YR 5/2) very friable structureless sandy loam; very little forest litter or leaf mold on the surface.
2. 5 to 15 inches, yellow (2.5YR 7/6), friable, structureless sandy loam.
3. 15 inches +, white to light-gray very friable disintegrated granite gneiss having a high quartz content.

The Louisa soils, in addition to being micaceous throughout their entire depth, differ from the Louisburg in having a brown very friable surface layer of very weak fine crumb structure, a yellowish-red very friable subsurface layer of weak fine crumb structure, and parent material of yellowish-red very friable, soft, decomposed mica schist. In general, the profile is a little deeper than that of Louisburg soils.

A number of Lithosols classified as miscellaneous land types occur in the county. These are Stony land, rolling; Stony land, hilly; Stony land, steep; and Gullied land. Bedrock outcrops occupy 10 to 50 percent of the surface of the stony lands, and boulders are common. The soil around the rock outcrops usually consists of Cecil or Lockhart soil material. It varies from shallow to moderately deep and because of unfavorable environment has very little if any genetic profile development. Gullied land consists mainly of areas of Cecil and Lockhart soils that were once cultivated. These areas have been reduced to an intricate system of gullies through erosion. In many places much of their profile has been washed away.

Regosols

Regosols are an azonal group of soils consisting of deep unconsolidated rock (soft mineral deposits) in which few or no clearly expressed soil characteristics have developed; they are largely confined to recent sand dunes, and to loess and glacial drift on steeply sloping lands (*12*).

The Molena series is the only member of the Regosols group in this county. The soil is on old high stream terraces where it has formed over old alluvium, mostly sand. The profile differs somewhat in color and texture but shows very little differentiation in consistence. This series has a counterpart in the Americus series of the Coastal Plain, but generally its soils contain somewhat more clay.

Molena loamy sand, eroded rolling phase, occurs in this county. Following is a profile description in a cleared area:

1. 0 to 12 inches, brown (7.5YR 4/4) very friable loamy sand; structureless.
2. 12 to 24 inches, yellowish red (5YR 4/6) very friable loamy sand; structureless.
3. 24 to 36 inches, red (2.5YR 4/8) very friable sandy loam; very weak medium granular structure.
4. 36 to 45 inches, red (2.5YR 4/8) very friable sandy loam; structureless.
5. 45 inches +, loose alluvial sand or loamy sand.

A light-colored variant of Molena loamy sand has formed that differs from the foregoing profile in being yellowish brown in the first three layers and considerably mottled with red in the lower layers.

Alluvial soils

Alluvial soils constitute an azonal group of soils that developed from transported and relatively recently deposited material (alluvium); they are characterized by a weak modification (or none) of the original material by soil-forming processes (*13*). In Fulton County the Starr, Seneca, Buncombe, Congaree, Chewacla, and Wehadkee series are classified as Alluvial soils.

Starr and Seneca soils have formed from local colluvium and alluvium accumulated on foot slopes and in positions along drainageways. They are not subject to overflow from streams. Relief is level to undulating, and the natural drainage is good. These soils receive creep and wash from soils on higher slopes, and they are kept relatively young by the addition of these materials from time to time. They usually have poorly developed profiles, and in nearly all places horizon differentiation is not distinct. In some places the profile is made up of interbanded deposits that differ in texture. The material of the Starr soils has come

mainly from Lloyd, Davidson, Cecil, and Madison soils, and their profiles usually are yellowish red. The material of the Seneca soils has come mostly from Appling, Cecil, and Madison soils, and their profiles usually are dark grayish brown in the upper part and grayish brown in the lower part.

The Congaree, Buncombe, Chewacla, and Wehadkee series comprise a catena in which the Buncombe is excessively drained; the Congaree, well drained; the Chewacla, somewhat poorly drained; and the Wehadkee, poorly drained. Differentiation among series of this group is made largely on the basis of differences in drainage.

The soils of this catena have counterparts in the Valley and Ridge province of the Appalachian Highlands. The Buncombe soil closely resembles the Bruno soils of that province; the Congaree, the Pope soils; the Chewacla, the Philo soils; and the Wehadkee, the Adkins soils.

Congaree fine sandy loam represents the well-drained Alluvial soils in this county. The profile has characteristics as follows:

1. 0 to 13 inches, dark yellowish-brown (10YR 4/4) very friable fine sandy loam having weak fine crumb structure.
2. 13 to 25 inches, yellowish-brown (10YR 4/4) friable fine sandy loam; weak fine crumb structure.
3. 25 to 45 inches, strong brown (7.5YR 5/6) very friable fine sandy loam, weak fine granular structure.
4. 45 inches +, friable young alluvium made up mostly of sand, silt, and clay.

The Buncombe soils consist of very friable loamy fine sand throughout its entire depth, but there is some color differentiation between the surface layer and the subsurface layer. The Chewacla profile is more mottled below the surface layer than the Congaree profile described above, and the Wehadkee profile differs chiefly in being mottled throughout its entire depth.

Included in the Alluvial soils group are the miscellaneous land types: Mixed alluvium, well drained; Mixed alluvium, somewhat poorly drained; Mixed alluvium, poorly drained; and Riverwash. The mixed alluviums consist of somewhat interbanded materials deposited near streams. They are differentiated principally on the basis of drainage, but they vary somewhat in color, texture, and consistence. Riverwash is composed of alluvium laid down by streams along their courses.

Soil Survey Methods

The scientist who makes a soil survey examines soils in the field, classifies them in accordance with facts that he observes, and maps their boundaries on an aerial photograph or other map (*17*).

Field study.—The soil surveyor bores or digs many holes to see what the soils are like. The holes are not spaced in a regular pattern, but are located according to the lay of the land. Usually they are not more than a quarter of a mile apart, but sometimes they are much closer. In most soils such a boring or hole reveals several distinct layers, called horizons, which collectively are known as the soil profile. Each layer is studied to see how it differs from others in the profile and to learn the things about this soil that influence its capacity to grow plants.

Color is usually related to the amount of organic matter. The darker the surface soil, as a rule, the more organic matter it contains. Streaks and spots of gray, yellow, and brown in the lower layers generally indicate poor drainage and poor aeration.

Texture, or the amount of sand, silt, and clay, is determined by the way the soil feels when rubbed between the fingers, and it is later checked by laboratory analysis. Texture determines how well soil retains moisture, plant nutrients, and fertilizer, and whether it is easy or difficult to cultivate.

Structure, which is the way the individual soil particles are arranged in larger grains, and the amount of pore space between grains, gives us clues to the ease or difficulty with which the soil is penetrated by plant roots and by moisture.

Consistence, or the tendency of the soil to crumble or to stick together, indicates whether it is easy or difficult to keep the soil open and porous under cultivation.

Other characteristics observed in the course of the field study and considered in classifying the soil include the following: The depth of the soil over bedrock, cemented or compact layers, or loose gravel strata; the presence of gravel or stones in amounts that will interfere with cultivation; the steepness and pattern of slopes and the degree of erosion; the runoff of surface water, drainage through the soil, and occurrence of a high ground-water table; the nature of the underlying rocks and parent material from which the soil has developed; and acidity or alkalinity of the soil as measured by chemical tests.

Simple chemical tests show how acid the soil may be. The reaction of a soil is its degree of acidity or alkalinity expressed mathematically as the pH value. A pH value of 7 indicates precise neutrality; higher values, alkalinity; and lower values, acidity. The degree of acidity or alkalinity is expressed in words and pH values as follows (*17*):

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5–5.0
Strongly acid	5.1–5.5
Medium acid	5.6–6.0
Slightly acid	6.1–6.5
Neutral	6.6–7.3
Mildly alkaline	7.4–7.8
Moderately alkaline	7.9–8.4
Strongly alkaline	8.5–9.0
Very strongly alkaline	9.1 and higher

Classification.—On the basis of the characteristics observed by the survey team or determined by laboratory tests, soils are classified into phases, types, and series. The soil type is the basic classification unit. A soil type may consist of several phases. Types that resemble each other in most of their characteristics are grouped into soil series.

As an example of soil classification, consider the Appling series of soils in Fulton County. Two types of the Appling series are located in the county: Appling sandy loam and Appling sandy clay loam. These types differ in the texture of the surface soil, as their names show. The Appling series is divided into nine

phases, or mapping units, because of differences in slope and erosion.

The following shows how the Appling series is grouped into types, and the types, in turn, into phases:

Series	Type	Phases
Appling	Appling sandy loam	Undulating phase. Eroded undulating phase. Rolling phase. Eroded rolling phase. Hilly phase. Eroded hilly phase. Steep phase.
	Appling sandy clay loam	Severely eroded rolling phase. Severely eroded hilly phase

Soil type. Soils similar in kind, thickness, and arrangement of soil layers are classified as one soil type.

Soil phase.—Because of differences other than those of kind, thickness, and arrangement of layers, some soil types are divided into two or more phases. Slope variations, frequency of rock outcrops, degree of erosion, depth of soil over the substratum, type of drainage (natural or artificial), and presence of excess soluble salts are examples of characteristics that suggest dividing a soil type into phases.

The soil phase (or the soil type if it has not been subdivided) is the unit shown on the soil map. It is the unit that has the narrowest range of characteristics. Use and management practices therefore can be specified for the soil phase more easily than for soil series or yet broader groups that contain more variation.

Soil series.—Two or more soil types that differ in surface texture, but that are otherwise similar in kind, thickness, and arrangement of soil layers, are normally designated as a soil series. In a given area, however, it frequently happens that a soil series is represented by only one soil type. Each series is named for a place near which the soil was first mapped. Thus, Appling is the name of a soil series that occurs over granite or gneiss, or mica schist in places, in Fulton County. It was first recognized near the town of Appling in Columbia County, Ga., in 1911.

Miscellaneous land types. Fresh stream deposits, or rough, stony, and severely gullied areas that have little true soil are not classified by types and series; they are identified by descriptive names such as stony land, riverwash, and so on. Riverwash, and Stony land, steep, are examples of miscellaneous land types in Fulton County.

Soil complex.—When two or more soils are so intricately associated in small areas that it is not feasible to show them separately on the soil map, they are mapped together and called a soil complex. Lockhart–Cecil sandy loams, hilly phases, is a complex of Lockhart sandy loam, hilly phase, and Cecil sandy loam, hilly phase.

Definitions of many soil terms used in the report are given in the glossary.

Literature Cited

(1) Alexander, E. D.
1940. Pastures for Georgia. Ga. Agr. Ext Serv. Bul. 457 (rev.): 24 pp., illus.

(2) ——— and Preston, J. B.
1943. Pastures for Georgia. Ga. Agr. Ext. Serv. Cir. 304: 8 pp (rev. 1947).

(3) Cooper, W. G.
1934. Official history of Fulton County. 912 pp., illus. Atlanta, Ga.

(4) Davis, V. B.
1941. Forest site quality in Georgia. U. S. Forest Serv., South. Forest Ext. Sta. Southern Forestry Notes. (No. 33): 1–3, illus.

(5) Fenneman, N. M.
1938. Physiography of eastern United States. 714 pp., illus. New York and London.

(6) Georgia Division of Mines, Mining and Geology.
1939. Geologic map of Georgia. U. S. Geol. Survey Map. 1 p., illus.

(7) ———
1928. Temperature, sunshine, and wind. U. S. Dept. Agr. Atlas of Amer. Agr., pt. 2, Advn. Sheets No. 7, 34 pp., illus.

(8) LaForge, L.
1925. The provinces of appalachian Georgia. Ga. Geol. Survey Bul. 42: 57–92, illus.

(9) Marbut, C. F.
1935. Soils of the United States. U. S. Dept. Agr. Atlas Amer Agr., pt. 3, Advn. Sheets No. 8, 98 pp., illus.

(10) Shantz, H. L., and Zon, R.
1924. Natural vegetation. U. S. Dept. Agr. Atlas of Amer. Agr., pt. 1, Advn. Sheets No. 6, 29 pp., illus.

(11) Simonson, R. W
1951 Description of mottling in soils. Soil Sci. 71: 187–192, illus.

(12) Thorp, J., and Smith, Guy D.
1949. Higher categories of soil classification: order, suborder, and great soil groups. Soil Sci. 67: 117–126.

(13) United States Department of Agriculture.
1938. Soils and men. U. S. Dept. Agr. Ybk. 1938, 1232 pp., illus.

(14) ———
1941. Climate and man. U. S. Dept. Agr. Ybk. 1941, 1248 pp., illus.

(15) ———
1947. Science in farming. U. S. Dept. Agr. Ybk. 1943–1947, 944 pp., illus.

(16) ———
1949. Trees. U. S. Dept. Agr. Ybk. 1949, 944 pp., illus.

(17)
1951. Soil survey manual. U. S. Dept. Agr. Handbook No. 18, 503 pp., illus.

Glossary

Alluvium. Sand, mud, and other sediments deposited on land by streams.

Bedrock. The solid rock underlying soils and other earthy surface formations.

Clay. Mineral soil particles less than 0.002 mm. (0.000079 in.) in diameter. (Formerly included grains less than 0.005 mm. in diameter.)

Claypan. Compact horizons or layers rich in clay and separated more or less abruptly from the overlying horizon.

Colluvium. Deposits of rock fragments and soil material near the base of slopes. The deposits have accumulated through the influence of gravity and includes creeps, slides, and local wash. In many areas colluvium is of mixed character.

Complex, soil. An intricate mixture of areas of different kinds of soil that are too small to be shown separately on maps of the scale used and are therefore mapped as a unit.

Consistence, soil. The degree and kind of cohesion and adhesion or the resistance to deformation or rupture of the soil aggregates; the relative mutual attraction of the particles in the whole mass, or their resistance to sepa-

ration. Terms commonly used to describe consistence include compact, firm, friable, loose, plastic, and sticky.

Compact. Dense and firm but without any cementation.

Firm. Soil material crushes under moderate pressure between thumb and forefinger but resistance is distinctly noticeable.

Friable. Soil material crushes easily under gentle to moderate pressure between thumb and forefinger, and coheres when pressed together.

Loose. Noncoherent.

Plastic. Soil material forms wirelike shape when rolled between thumb and forefinger, and moderate pressure is required to deform the soil mass.

Sticky. Adhesive rather than cohesive when wet, but usually very cohesive when dry. When wet, the soil shows a decided tendency to adhere to other material and objects.

Contour tillage. Furrows plowed at right angles to the direction of slope, at the same level throughout, and ordinarily at comparatively close intervals.

Cropland. Land regularly used for crops, except forest crops. It includes rotation pasture, cultivated summer fallow, and temporarily idle land.

Crumb (*See also* Structure, type). Generally soft, small, porous aggregates, tending toward a spherical shape, as in the A_1 horizons of many soils. Crumb structure is closely related to granular structure.

Erosion, soil. The wearing away or removal of soil material by water or wind.

Fertility, soil. The inherent quality of a soil as measured by the quantity of compounds provided for proper or balanced growth of plants.

First bottom. The normal flood plain of a stream subject to frequent or occasional flooding.

Forest. Land not in farms, bearing a stand of trees of any age or stature, including seedlings, and of species that attain a minimum average height of 6 feet at maturity; or land from which such a stand has been removed and no other use substituted. Forest on farms is commonly called woodland or farm forest.

Genesis, soil. (*See also* **Horizon, soil**). The mode of origin of the soil with special reference to the processes responsible for the development of the solum (horizons A and B) from the unconsolidated parent material.

Granular (*See also* **Structure, type**). Roughly spherical aggregates that may be either hard or soft, usually more firm than crumb, and without the distinct faces of blocky structure.

Great soil group (soil classification). A broad group of soils having common internal soil characteristics.

Green-manure crop. Any crop grown and plowed under while green for the purpose of improving the soil.

Horizon, soil. A layer of soil approximately parallel to the soil surface with distinct characteristics produced by soil forming processes.

Horizon, A. The upper horizon of the soil mass from which material has been removed by percolating waters; the eluviated part of the solum; the surface soil. It is generally subdivided into two or more subhorizons, of which A_0 is not a part of the mineral soil but the accumulation of organic debris on the surface. Other subhorizons are designated as A_1, A_2, and so on.

Horizon, B. The horizon of deposition, to which materials have been added by percolating waters; the illuviated part of the solum; the subsoil. This horizon may also be divided into several subhorizons, depending on the color, structure, consistence, or character of the material deposited. These layers are designated as B_1, B_2, B_3, and so on.

Horizon, C. The horizon of partly weathered material underlying the B horizon; the substratum; usually the parent material.

Internal drainage. The movement of water through the soil profile. The rate of movement is affected by the texture of the surface soil and subsoil, and by the height of the ground water table, either permanent or perched. Relative terms for expressing internal drainage follow: None, very slow, slow, medium, rapid, and very rapid.

Leaching, soil. The removal of materials in solution.

Massive (*See also* **Structure, grade**). Large uniform masses of cohesive soil, sometimes with ill-defined and irregular breakage, as in some of the fine textured alluvial soils; structureless.

Morphology, soil. The physical constitution of the soil including the texture, structure, consistence, color, and other physical and chemical properties of the various soil horizons that make up the soil profile.

Mottled. Marked with spots of color and usually associated with poor drainage. Descriptive terms for mottles follow: Contrast—faint, distinct, and prominent; abundance—few, common, and many; and size—fine, medium, and coarse. The size measurements are as follows: Fine, commonly less than 5 mm. [about 0.2 in.] in diameter along the greatest dimension; medium, commonly ranging between 5 and 15 mm. [about 0.2 to 0.6 in.] along the greatest dimension; and coarse, commonly more than 15 mm. [about 0.6 in.] along the greatest dimension (*11*).

Natural drainage. Refers to those conditions which existed during the development of the soil as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by such factors as sudden deepening of channels or blocking of drainage outlets. The following relative terms are used to express natural drainage: Very poorly drained, poorly drained, imperfectly or somewhat poorly drained, moderately well drained, well drained, somewhat excessively drained, and excessively drained.

Normal soil. A soil having a profile in near-equilibrium with its environment; developed under good but not excessive drainage from parent material of mixed mineral, physical, and chemical composition; and expressing in its characteristics the full effects of the forces of climate and living matter.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in elaboration of its food and tissue. Essential elements include nitrogen, phosphorus, calcium, potassium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and other elements mainly from the soil; and carbon, hydrogen, and oxygen mainly from the air and water.

Parent material (*See also* **Horizon, C; Profile, soil; and Substratum**). The unconsolidated mass of rock material (or peat) from which the soil profile develops.

Permeable. Easily penetrated, as by water or air.

Phase, soil. That subdivision of a soil type having variations in characteristics not significant to the classification of this soil in its natural landscape but significant to the use and management of the soil. The variations are chiefly in such external characteristics as relief, stoniness, or erosion. (Example: Cecil sandy loam, eroded hilly phase.)

Productivity, soil. The capability of a soil to produce a specified plant or sequence of plants under a defined set of management practices.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material. (*See* Horizon, soil.)

Reaction, soil. (*See* **Acidity in section on Soil Survey Methods.**)

Relief. Elevations or inequalities of the land surface, the slope gradient, and the pattern of these, considered collectively.

Runoff. This term refers to the amount of water removed by flow over the surface of the soil. The amount and rapidity of runoff are affected by factors such as texture, structure, and porosity of the surface soil; the vegetative covering; the prevailing climate; and the slope. Relative degree of runoff is expressed in six classes as follows: Ponded, very slow, slow, medium, rapid, and very rapid.

Sand. Small rock or mineral fragments that have diameters ranging between 0.05 mm. (0.002 in.) and 2.0 mm. (0.079 in.). The term sand is also applied to soils containing 85 percent or more of sand.

Series, soil. A group of soils having the same profile characteristics, the same general range in color, structure, consistence, and sequence of horizons, the same general conditions of relief and drainage, and usually a common or similar origin and mode of formation. A group of soil types that are closely similar in all respects except the texture of the surface soil.

Silt. Mineral particles of soil that range in diameter from 0.05 mm. (0.002 in.) to 0.002 mm. (0.000079 in.) in diameter; soil material that contains 80 percent or more of silt and less than 12 percent clay.

Single grain soil. (*See also* **Structure, grade**). A structureless soil in which each particle exists separately, as in dune sand.

Slope classes. As used in this report, they are as follows:

	Percent		*Percent*
Level	0–2	Hilly	10–15
Undulating	2–6	Steep	15–25
Rolling	6–10		

Soil. A natural body on the surface of the earth characterized by conformable layers resulting from modification of parent material by physical, chemical, and biological forces over periods of time.

Soil classes. Based on the relative proportion of soil separates. The principal classes, in increasing order of the content of the finer separates, are as follows: Sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay.

Soil separates. The individual size groups of mineral soil particles, as sand, silt, and clay.

Stripcropping. The practice of growing ordinary farm crops in long strips or bands of variable widths across the line of slope, or approximately on the contour. Close-growing crops are seeded in alternate strips with clean-tilled crops.

Structure, soil. The morphological aggregates in which the individual soil particles are arranged. It may refer to their natural arrangement in the soil when in place and undisturbed or to the soil at any degree of disturbance. Soil structure is classified according to grade, class, and type.

Grade. Degree of distinctness of aggregation. Grade expresses the differential between cohesion within aggregates and adhesion between aggregates. Terms: Structureless (single grain or massive), weak, moderate, and strong.

Class. Size of soil aggregates. Terms. Very fine or very thin, fine or thin, medium, coarse or thick, and very coarse or very thick.

Type. Shapes for soil aggregates. Terms: Platy, prismatic, columnar, blocky, subangular blocky, granular, and crumb. (Example of soil-structure grade, class, and type: Moderate coarse blocky.)

Subsoil. Technically, the B horizon of soils with distinct profiles; roughly, that part of the profile below plow depth.

Substratum (**See also Horizon, C; and Parent Material**). Any layer lying beneath the solum or true soil.

Surface soil. Technically, the A horizon; commonly, the part of the upper profile usually stirred by plowing.

Terrace (for control of runoff, soil erosion, or both). An embankment or ridge constructed across sloping soils on or approximately on contour lines, at specific intervals. The terrace intercepts surplus runoff in order to retard it for infiltration into the soil or to direct any excess flow to an outlet at nonerosive velocity.

Terrace (geological). An old alluvial plain, usually flat or undulating, bordering a stream; frequently called second bottoms as contrasted with flood plains; seldom subject to overflow.

Texture. Size of individual particles making up the soil mass. It specifically refers to the proportions of sand, silt and clay. A coarse-textured soil is one high in content of sand; a fine-textured soil has a large proportion of clay.

Type, soil. A subdivision of the soil series based on the texture of the surface soil.

Upland (geologic). Land consisting of material unworked by water in recent geologic time and lying in general at higher elevation than the alluvial plain or stream terrace.

Principal characteristics of the

Soil	Map symbol	Slope range	Parent material	Topographic position	Natural drainage	Soil profile	
						Surface soil	Subsoil
		Percent					
Altavista fine sandy loam:							
Eroded rolling phase	Ac	6-10	Moderately young alluvial materia..	Low stream terraces	Moderately good to somewhat excessive.	Light olive-brown to olive-brown very friable or friable fine sandy loam, or friable heavy fine sandy loam.	Olive-yellow firm, heavy fine sandy clay loam passing into light olive-brown (mottled with red) friable fine sandy clay loam.
Level phase	Ae	0- 2	Same	Low stream terraces	Moderately good	Light olive-brown very friable fine sandy loam.	Same
Undulating phase	Ab	2- 6	Same	Low stream terraces	Moderately good	Same	Same
Appling sandy clay loam							
Severely eroded hilly phase	Ae	10-15	Residual material from weathered granite or gneiss, or mica schist in places.	Short strong slopes near or along drainageways.	Somewhat excessive	Grayish-brown to yellowish-red friable sandy clay loam.	Yellowish-red firm sandy clay in upper part, yellowish-red (mottled with gray and brown friable sandy clay in lower part.
Severely eroded rolling phase	Ad	6-10	Same	Fairly smooth interstream divides and moderate slopes to or toward drainageways.	Good to somewhat excessive.	Same	Yellowish-red firm sandy clay in upper part; yellowish-red (mottled with gray and red) friable sandy clay in lower part.
Appling sandy loam:							
Eroded hilly phase	Am	10-15	Same	Short strong slopes near or adjoining drainageways.	Somewhat excessive.	Grayish-brown friable sandy loam, or grayish-brown to yellowish-red friable sandy loam to heavy sandy loam.	Same
Eroded rolling phase	Ak	6-10	Same	Broad fairly smooth interstream divides and gradual slopes to or toward drainageways.	Good to somewhat excessive.	[illegible]	[illegible]
Eroded undulating phase	Ag	2- 6	Same	Smooth interstream divides and gentle slopes to or toward drainageways.	Good	Same	Same
Hilly phase	Al	10-15	Same	Short strong slopes near or adjoining drainageways.	Somewhat excessive	Grayish-brown friable sandy loam.	Same
Rolling phase	Ah	6-10	Same	Fairly smooth interstream divides and moderate slopes to or toward drainageways.	Good to somewhat excessive.	Same	Same
Steep phase	As	15-25	Same	Short very strong slopes adjacent to drainageways.	Somewhat excessive to excessive.	Same	Same
Undulating phase	Al	2- 6	Same	Smooth interstream divides and gentle slopes to or toward drainageways.	Good.	Same	Same
Augusta fine sandy loam	Ao	0- 6	Moderately young alluvial material.	Low stream terraces	Somewhat poor	Light brownish-gray very friable fine sandy loam.	Light yellowish-brown firm fine sandy clay loam; light-gray (mottled with white and brownish-yellow) firm fine sandy clay in lowest part.
Buncombe loamy fine sand	Bu	0- 2	Young alluvial material	First bottoms near stream banks; subject to overflow	Excessive	Yellowish-brown very friable loamy fine sand.	Reddish-yellow very friable loamy fine sand.[3]
Cecil clay loam							
Severely eroded hilly phase	Cb	10-15	Residual material from weathered gneiss or granite, or mica schist in places.	Short strong slopes near or along drainageways.	Somewhat excessive	Red to reddish-brown friable clay loam.	Red firm heavy clay
Severely eroded rolling phase	Cn	6-10	Same	Fairly smooth interstream divides and moderate slopes to or toward drainageways.	Good to somewhat excessive.	[illegible]	Same
Severely eroded steep phase	Cc	15-25	Same	Breaks or short very strong slopes adjoining drainageways.	Somewhat excessive to excessive.	Red friable clay loam	Same
Cecil sandy loam:							
Eroded hilly phase	Ck	[illegible]	Same	Short strong slopes near or adjacent to drainageways.	Somewhat excessive	Pale-yellow to reddish-brown friable sandy loam, or reddish-brown to red friable clay loam.	Red firm clay
Eroded rolling phase	Cn	6-10	Same	Broad fairly smooth interstream divides and gradual slopes to or toward drain- [illegible]	Good to somewhat excessive.	Same	Red firm clay
Eroded steep phase	Cm	[illegible]	Same	Breaks or short very strong slopes adjoining drainage- [illegible]	Somewhat excessive to excessive.	Same	Red firm clay

soils of Fulton County, Georgia

Soil depth [1]	Erosion hazard	Permeability		Moisture-holding capacity	Natural fertility	Workability	Range of suitability	Principal use	Management group
		Surface soil	Subsoil						
Deep	Moderate to high	Moderate	Moderate to slow	Moderate	Low	Good	Medium	Cultivated land and pasture	A-4.
Deep	None to slight	Moderately rapid	Moderate to slow	Moderate	Low	Very good	Wide	Same	A-3.
Deep	Slight to moderate	Moderately rapid	Moderate to slow	Moderate	Low	Very good	Wide	Same	A-3.
Deep	High	Moderate	Moderate	Moderate	Low	Very poor	Very narrow	Forest, idle land, and pasture	C-1.
Deep	Moderate to high	Moderate	Moderate	Moderate	Low	Fair	Narrow	Same	B-1
Deep	High	Moderate to moderately rapid	Moderate	[illegible]	Low	Poor	Narrow	Forest, cultivated land, idle land, and pasture.	B-3.
Deep	Moderate to high	Same	Moderate	Moderate	Low	Fair to good	Medium	Cultivated land, pasture, and idle land.	A-4.
Deep	Slight to moderate	Same	Moderate	Moderate	Low	Very good	Wide	Same	A-3.
Deep	High	Moderately rapid	Moderate	Moderate	Low	Poor	Narrow	Forest	B-3.
Deep	Moderate to high	Moderately rapid	Moderate	Moderate	Low	Good	Medium	Cultivated land, pasture, and idle land	A-4
Deep	High to very high	Moderately rapid	Moderate	Moderate	Low	Poor to very poor	Very narrow	Forest	C-1
Deep	Slight to moderate	Moderately rapid	Moderate	Moderate	Low	Very good	Wide	Cultivated land, pasture, and idle land	A-3.
Deep	Slight to moderate	Moderate	Slow	Moderate	Low	Fair	Medium	Cultivated land and idle land.	A-6.
Deep	None; alluvium deposited periodically	Very rapid	Very rapid [2]	Low	Low	Very good	Narrow	Forest, idle land, cultivated land, and pasture.	C-1.
Deep	High	Moderate	Moderate	Moderate	Low	Very poor	Very narrow	Forest and idle land	C-1.
Deep	Moderate to high	Moderate	Moderate	Moderate	Low	Poor	Narrow	Same	B-1
Deep	High to very high	Moderate	Moderate	Moderate	Low	Very poor	Very narrow	Forest.	C-1.
Deep	High	Moderately rapid to moderate	Moderate	Moderate	Low	Poor	Narrow	Forest, cultivated land, and pasture.	B-3.
Deep	Moderate to high	Same	Moderate	Moderate	Low	Good	Medium	Cultivated land and pasture	A-1.
Deep	High to very high	Same	Moderate	Moderate	Low	Very poor	Very narrow	Forest	C-1.

Principal characteristics of the soils of

Soil	Map symbol	Slope range	Parent material	Topographic position	Natural drainage	Soil profile	
						Surface soil	Subsoil
		Percent					
Cecil sandy loam—Continued:							
Eroded undulating phase	Cu	2–6	Same	Smooth interstream divides and mild slopes to or toward drainageways.	Good	Same	Red firm clay
Hilly phase	Ch	10–15	Same	Short strong slopes near or adjacent to drainageways.	Somewhat excessive.	Yellowish-brown friable sandy loam underlain by yellowish-red friable heavy sandy loam	Red firm clay
Rolling phase	Cf	[illegible]	Same	Fairly smooth interstream divides and moderate slopes to or toward drainageways.	Good to somewhat excessive.	Same	Red firm clay
Steep phase	Cl	15–25	Same	Breaks or short very strong slopes adjoining drainageways.	Somewhat excessive to excessive.	Same	Red firm clay
Undulating phase	Cd	2–6	Same	Smooth interstream divides and mild slopes to or toward drainageways	Good	Same	Red firm clay
Chewacla fine sandy loam	Ca	0–2	Young alluvial material	First bottoms, subject to overflow	Somewhat poor	Brown friable fine sandy loam	Light-brown to brown friable fine sandy loam mottled with gray and reddish brown
Chewacla silt loam	Co	0–2	Young alluvial material	Same	Somewhat poor	Brown friable silt loam	Light-brown to brown friable silt loam mottled with gray and reddish brown.
Congaree fine sandy loam	Cp	0–2	Young alluvial material	Same	Good	Dark yellowish-brown very friable fine sandy loam	Yellowish-brown friable fine sandy loam, underlain by strong-brown very friable fine sandy loam.[3]
Congaree silt loam	Cr	0–2	Young alluvial material	Same	Good	Dark yellowish-brown very friable silt loam	Yellowish-brown friable silt loam, underlain by strong-brown very friable silt loam.[3]
Davidson clay loam:							
Eroded hilly phase	Dc	10–15	Residual material from weathered dark-colored basic rock, chiefly hornblende schist	Short strong slopes near or along drainageways.	Somewhat excessive.	Dark reddish-brown friable to firm clay loam.	Dark-red firm clay passing into dark-red friable clay loam near the bottom.
Eroded rolling phase	Db	6–10	Same	Fairly smooth interstream ridges and moderate slopes to or toward drainageways.	Good to somewhat excessive.	Same	Same
Eroded undulating phase	Du	2–6	Same	Smooth interstream ridges and mild slopes to or toward drainageways.	Good	Same	Same
Grover fine sandy loam:							
Eroded hilly phase	Gb	[illegible]	Residual material from weathered quartz mica schist, or highly micaceous gneiss.	Short strong slopes near or adjoining drainageways.	Somewhat excessive.	Light olive-brown friable fine sandy loam.	Reddish-yellow friable sandy clay loam in upper half, brownish-yellow friable sandy clay loam in lower half.
Eroded undulating phase	Gu	2–6	Same	Smooth interstream ridges and gentle slopes to or toward drainageways.	Good	Same	Same
Gullied land	Ge	6–15	Residual material from weathered granite, gneiss, or schist.	Moderate slopes leading to drainageways.	Excessive		
Helena sandy loam, eroded rolling phase.	Hn	6–10	Residual material from weathered aplitic granite, or diorite in places.	Fairly smooth interstream ridges and moderate slopes to or toward drainageways.	Somewhat poor	Light brownish-gray friable sandy loam.	Yellow, mottled with brown and red, very firm tough heavy sandy clay, light-gray firm heavy sandy clay loam in bottom part.
Hiwassee-Louisa soils, eroded hilly phases.	Hd	10–15	Old alluvial material (Hiwassee); residual material from weathered mica schist (Louisa)	Narrow escarpments between first bottoms and stream terraces, or between stream terraces and uplands	Somewhat excessive to excessive.	Dark reddish-brown friable sandy loam or dark-red heavy sandy loam (Hiwassee), brown to yellowish-red very friable fine sandy loam (Louisa).	Dark-red friable clay loam passing into dark-red friable fine sandy clay in bottom part (Hiwassee); yellowish-red very friable fine sandy loam[3] (Louisa).
Hiwassee sandy loam:							
Eroded rolling phase	Hc	6–10	Old alluvial material	High stream terraces	Good to somewhat excessive.	Dark reddish-brown friable sandy loam, or dark-red heavy sandy loam.	Dark-red friable clay loam passing into dark-red friable fine sandy clay in bottom part.
Eroded undulating phase	Hb	2–6	Old alluvial material	High stream terraces.	Good	Same.	Same
Iredell stony clay loam, rolling phase.	Ic	6–10	Residual material mainly from weathered diorite.	Fairly smooth interstream ridges and moderate slopes near drainageways.	Somewhat poor	Dark grayish-brown friable stony clay loam.	Light olive-brown very firm heavy clay

Fulton County, Georgia—Continued

Soil depth [1]	Erosion hazard	Permeability		Moisture-holding capacity	Natural fertility	Workability	Range of suitability	Principal use	Management group
		Surface soil	Subsoil						
Deep	Moderate	Same	Moderate	Moderate	Low	Very good	Wide	Cultivated land and pasture	A-2.
Deep	High	Moderately rapid	Moderate	Moderate	Low	Poor	Narrow	Forest	B-3
Deep	Moderate to high	Moderately rapid	Moderate	Moderate	Low	Good	Medium	Forest, cultivated land, and pasture.	A-1
Deep	High to very high	Moderately rapid	Moderate	Moderate	Low	Poor to very poor	Very narrow	Forest	C-1
Deep	Slight to moderate	Moderately rapid	Moderate	Moderate	Medium to low	Very good	Wide	Cultivated land and pasture	A-2.
Deep water table moderately high	None, alluvial material deposited periodically	Moderate	Slow	Very high	High	Good	Medium	Cultivated land, pasture, and forest.	A-5.
Same	Same	Moderate	Slow	Very high	Very high	Good	Medium	Same	A-5.
Deep	Same	Moderately rapid	Moderate [1]	Very high	High	Very good	Wide	Cultivated land and pasture	A-5.
Deep	Same	Moderate	Moderate [1]	Very high	Very high	Good	Wide	Same	A-5.
Deep to very deep.	High	Moderate	Moderate	Moderate	Moderate	Poor	Narrow	Same	B-3.
Same	Moderate to high	Moderate	Moderate	Moderate	Moderate	Fair	Medium	Same	A-1.
Same	Slight to moderate	Moderate	Moderate	Moderate	Moderate	Good	Wide	Same	A-2.
Moderately deep to deep	High	Moderately rapid to moderate.	Moderate	Moderate	Low	Poor	Narrow	Cultivated land, idle land, and pasture.	B-3.
Same	Moderate.	Same	Moderate	Moderate	Low	Very good	Wide	Cultivated land and pasture	A-3.
	High to extremely high			Low to moderate	Very low	Very poor	Very narrow	Pasture, idle land, and forest	C-1
Moderately deep.	Moderate to high	Moderately rapid	Slow	Moderately low to low.	Low	Poor	Medium	Cultivated land, idle land, pasture, and forest.	B-4.
Deep to shallow.	High	Moderate	Moderate (Hiwassee) rapid [1] (Louisa)	Moderate to low	Moderate to low	Poor to very poor	Narrow	Forest	C-1.
Deep	Moderate to high	Moderate to moderately rapid.	Moderate	Moderate	Moderate	Fair	Medium	Cultivated land and pasture	A-1
Deep	Moderate	Same	Moderate	Moderate	Moderate	Good	Wide	Same	A-2.
Shallow	Moderate to high	Moderately slow to slow.	Very slow	Moderate to low.	Moderate	Very poor	Narrow	Same	C-1

Principal characteristics of the soils of

Soil	Map symbol	Slope range	Parent material	Topographic position	Natural drainage	Soil profile	
						Surface soil	Subsoil
		Percent					
Lloyd clay loam:							
Eroded steep phase	Lc	15–25	Residual material from weathered basic rock and intermixed granite, gneiss, or mica schist.	Breaks or very strong slopes along drainageways.	Excessive	Reddish-brown friable clay loam.	Red firm clay loam
Severely eroded hilly phase	Lb	10–15	Same	Short strong slopes near or adjacent to drainageways.	Excessive	Red to reddish-brown friable clay loam.	Red firm clay loam
Severely eroded rolling phase	Ld	6–10	Same	Fairly smooth interstream ridges and moderate slopes to or toward drainageways.	Somewhat excessive	Same	Red firm clay loam
Lloyd gravelly sandy loam, eroded steep shallow phase	Ld	15–25	Same	Breaks or short very strong slopes adjoining drainageways.	Excessive	Reddish-brown very friable gravelly sandy loam	Red firm clay loam
Lloyd sandy loam:							
Eroded hilly phase	Lk	10–15	Same	Short strong slopes near or leading to drainageways	Somewhat excessive	Reddish-brown friable sandy loam.	Red firm clay loam
Eroded rolling phase	Lg	6–10	Same	Fairly smooth interstream ridges and moderate slopes to or toward drainageways.	Good to somewhat excessive	Same	Red firm clay loam
Eroded undulating phase	Le	2–6	Same	Smooth interstream ridges and mild slopes to or toward drainageways.	Good	Same	Red firm clay loam
Hilly phase	Lh	10–15	Same	Short strong slopes near or leading to drainageways.	Somewhat excessive	Same	Red firm clay loam
Rolling phase	Lf	6–10	Same	Fairly smooth interstream ridges and moderate slopes to or toward drainageways.	Good to somewhat excessive	Same	Red firm clay loam
Steep phase	Ln	15–25	Same	Breaks or short very strong slopes adjoining drainageways.	Somewhat excessive to excessive	Same	Red firm clay loam
Lockhart-Cecil clay loams:							
Severely eroded hilly phases	Lo	10–15	Residual material from weathered porphyritic granite for the Lockhart soil granite gneiss, or mica schist for the Cecil.	Short strong slopes near or adjoining drainageways.	Somewhat excessive	Red to reddish-brown friable clay loam.	Red firm clay loam (Lockhart) or firm heavy clay (Cecil)
Severely eroded rolling phases	Ln	6–10	Same	Fairly smooth interstream divides and moderate slopes to or toward drainageways.	Good to somewhat excessive	Same	Same
Severely eroded steep phases	Lp	15–25	Same	Breaks or short very strong slopes adjacent to drainage-	Somewhat excessive to excessive	Red friable clay loam	Same
Lockhart-Cecil sandy loams:							
Eroded hilly phases	Lv	10–15	Same	Short strong slopes near or descending to drainageways.	Somewhat excessive	Yellowish-brown, grayish-yellow, or reddish-brown friable sandy loam to reddish-brown or red friable clay loam.	Red firm clay loam (Lockhart) or clay (Cecil)
Eroded rolling phases	Ls	6–10	Same	Fairly smooth interstream divides and moderate slopes to or toward drainageways.	Good to somewhat excessive	Same	Same
Eroded steep phases	Lw	15–25	Same	Breaks or short very strong slopes adjacent to drainageways.	Somewhat excessive to excessive	Yellowish-brown, grayish-yellow, or reddish-brown friable sandy loam to reddish-brown friable clay loam.	Same
Eroded undulating phases	Lr	2–6	Same	Smooth interstream divides and mild slopes to or toward drainageways.	Good	Yellowish-brown, grayish-yellow, or reddish-brown friable sandy loam to reddish-brown or brownish-red friable clay loam	Same
Hilly phases	Lt	10–15	Same	Short strong slopes near or descending to drainageways.	Somewhat excessive	Yellowish-brown or grayish-yellow friable sandy loam.	Same
Steep phases	Lv	[illegible]	Same	Breaks or short very strong slopes adjacent to drainageways.	Somewhat excessive to excessive.	Same	Same
Louisa fine sandy loam							
Eroded hilly phase	Lxe	10–15	Residual material from weathered mica schist or quartz mica schist.	Strong slopes descending from narrow ridge crests.	Somewhat excessive	Brown to reddish-brown very friable micaceous fine sandy loam.	Yellowish-red very friable soft micaceous fine sandy loam.[2]
Eroded steep phase	Lxc	15–25	Same	Very strong slopes descending from narrow ridge crests.	Somewhat excessive to excessive	Same	Same[2]
Rolling phase	Lx	6–10	Same	Long narrow ridge crests.	Good to somewhat excessive.	Brown very friable micaceous fine sandy loam.	Same[2]

Fulton County, Georgia—Continued

Soil depth [1]	Erosion hazard	Permeability		Moisture-holding capacity	Natural fertility	Workability	Range of suitability	Principal use	Management group
		Surface soil	Subsoil						
Moderately deep.	High to very high.	Moderate.	Moderate.	Moderate to moderately low.	Moderate	Very poor	Very narrow	Forest	C-1.
Moderately deep.	Same	Moderate	Moderate	Same	Moderate	Very poor	Very narrow	Forest	C-1.
Moderately deep.	High	Moderate	Moderate	Same	Moderate	Poor	Narrow	Forest	B-1.
Shallow	High to very high	Rapid	Moderate to rapid	Low	Low	Very poor	Very narrow	Forest	C-1
Moderately deep to deep.	High	Moderately rapid to moderate.	Moderate	Moderate	Moderate	Poor	Narrow to medium.	Cultivated land, pasture, and forest.	B-3.
Deep to moderately deep.	Moderate to high	Same	Moderate	Moderate	Moderate	Good	Medium	Cultivated land and pasture	A-1.
Same	Slight to moderate	Same	Moderate	Moderate	Moderate	Very good to good	Wide	Same	A-2.
Deep	High	Moderately rapid	Moderate	Moderate	Moderate	Poor	Narrow to medium.	Forest and pasture	B-3.
Deep	Moderate to high.	Moderately rapid.	Moderate	Moderate	Moderate	Good	Medium	Cultivated land and pasture	A-1.
Moderately deep.	High to very high	Moderately rapid	Moderate	Moderate	Moderate	Poor to very poor.	Very narrow	Forest	C-1.
Deep	High	Moderate	Moderate	Moderate	Low	Very poor	Very narrow	Forest and idle land	C-1.
Deep	Moderate to high	Moderate.	Moderate	Moderate	Low	Poor	Narrow	Same	B-1.
Deep.	High to very high.	Moderate	Moderate	Moderate	Low	Very poor	Very narrow	Forest	C-1.
Deep	High	Moderately rapid to moderate.	Moderate	Moderate	Low	Poor	Narrow	Forest, cultivated land, and idle land.	B-3.
Deep	Moderate to high.	Same	Moderate	Moderate	Low	Good	Medium	Cultivated land and pasture	A-1.
Deep	Very high	Same	Moderate.	Moderate	Low	Very poor	Very narrow	Forest	C-1.
Deep	Moderate	Same	Moderate	Moderate	Low	Very good	Wide.	Cultivated land and pasture.	A-2.
Deep.	High	Moderately rapid	Moderate	Moderate	Low	Poor	Narrow	Forest	B-3.
Deep.	High to very high	Moderately rapid	Moderate	Moderate	Low	Poor to very poor.	Very narrow	Forest	C-1
Shallow to moderately deep	High	Moderate to moderately rapid	Moderately rapid [2]	Low to very low	Low	Same	Very narrow	Forest	C-1
Same	High to very high	Same	Moderately rapid [1]	Very low	Low	Very poor	Very narrow.	Forest	C-1.
Moderately deep.	Moderate to high	Moderate	Moderately rapid [1]	Low	Low	Good	Very narrow	Forest and cultivated land	C-1.

Principal characteristics of the soils of

Soil	Map symbol	Slope range	Parent material	Topographic position	Natural drainage	Soil profile	
						[illegible] soil	Subsoil
		Percent					
Louisa fine sandy loam—Continued							
Steep phase	Lxb	15–25	Same	Very strong slopes descending from narrow ridge crests.	Somewhat excessive to excessive.	Same	Same [3]
Louisburg sandy loam:							
Hilly phase	Lya	10–15	Residual material from weathered granite gneiss or granite.	Strong slopes descending from from narrow ridgetops.	Somewhat excessive	Grayish-brown very friable sandy loam.	Yellow friable sandy loam [3]
Rolling phase	Ly	6–10	Same	Narrow fairly smooth ridgetops.	Somewhat excessive	Same	Yellow friable sandy loam [3]
Steep phase	Lyb	15–25	Same	Very strong slopes or breaks adjacent to drainageways.	Somewhat excessive to excessive.	Same	Yellow friable sandy loam [3]
Made land	Ma	0–2					
Madison clay loam:							
Severely eroded hilly phase	Mc	10–15	Residual material from weathered quartz mica schist.	Short strong slopes near or along drainageways.	Somewhat excessive	Red to reddish-brown friable clay loam.	Red friable clay loam; considerable quantity of mica flakes in lower part.
Severely eroded rolling phase	Mb	6–10	Same	Fairly smooth interstream ridges and moderate slopes to or toward drainageways.	Good to somewhat excessive.	Same	Same
Madison fine sandy loam:							
Eroded hilly phase	Mh	10–15	Same	Short strong slopes near or along drainageways.	Somewhat excessive.	Brown very friable fine sandy loam to reddish-brown friable heavy fine sandy loam or light clay loam	Same
Eroded rolling phase	Mf	6–10	Same	Broad fairly smooth interstream ridges and moderate slopes to or toward drainageways.	Good to somewhat excessive.	[illegible]	Same
Eroded undulating phase	Mdf	2–6	Same	Broad smooth interstream ridges and mild slopes to or toward drainageways.	Good	Same	Same
Hilly phase	Mg	10–15	Same	Short strong slopes near or along drainageways.	Somewhat excessive	Brown very friable fine sandy loam.	Same
Rolling phase	Me	6–10	Same	Fairly smooth interstream ridges and moderate slopes to or toward drainageways.	Good to somewhat excessive.	Same	Same
Steep phase	Mk	15–25	Same	Breaks or very strong slopes adjacent to drainageways.	Somewhat excessive to excessive.	Same	Same
Madison gravelly sandy loam:							
Eroded rolling phase	Mm	6–10	Same	Fairly smooth interstream ridges and moderate slopes to or toward drainageways.	Good to somewhat excessive.	Brown very friable gravelly sandy loam to reddish-brown friable heavy gravelly sandy loam or light clay loam.	Same
Rolling phase	Ml	6–10	Same	Same	Same	Brown very friable gravelly sandy loam.	Same
Madison–Grover–Louisa gravelly clay loams, severely eroded hilly phases.	Mn	10–15	Residual material from weathered mica schist or highly micaceous gneiss.	Short strong slopes near or along drainageways.	Somewhat excessive	Red, reddish-brown, light olive-yellow, or yellowish-red friable gravelly clay loam to reddish-brown or yellowish-red very friable micaceous gravelly sandy loam.	Red friable clay loam in the Madison soil; reddish-yellow to brownish-yellow friable sandy clay loam in the Grover, and yellowish-red soft very friable micaceous sandy loam subsurface in the Louisa.
Madison–Grover–Louisa gravelly sandy loams:							
Eroded hilly phases	Mp	10–15	Same	Short strong slopes near or adjoining drainageways.	Somewhat excessive	Brown very friable gravelly sandy loam to reddish-brown very friable heavy gravelly sandy loam or light clay loam in the Madison soil, light olive-yellow friable gravelly sandy loam in the Grover and brown to reddish-brown very friable gravelly micaceous sandy loam in the Louisa.	Same
Hilly phases	Mo	10–15	Same	Same	Somewhat excessive	Brown very friable gravelly sandy loam in the Madison soil light olive-yellow friable gravelly sandy loam in the Grover, and brown very friable gravelly micaceous sandy loam in the Louisa.	Same

Fulton County, Georgia—Continued

Soil depth [1]	Erosion hazard	Permeability		Moisture-holding capacity	Natural fertility	Workability	Range of suitability	Principal use	Management group
		Surface soil	Subsoil						
Moderately deep.	High to very high.	Moderate	Moderately rapid [2]	Low to very low	Low	Very poor	Very narrow	Forest	C-1.
Shallow	High	Rapid to moderately rapid.	Moderately rapid to rapid. [2]	Same	Low	Fair	Very narrow	Forest	C-1.
Shallow	Moderate to high	Same	Same [2]	Low	Low	Good	Very narrow	Forest	C-1.
Shallow	High to very high.	Same	Same [2]	Low to very low	Low	Poor to very poor.	Very narrow	Forest	C-1
									C-1.
Deep	High	Moderate	Moderate	Moderate	Low	Very poor	Very narrow	Forest, idle land, and pasture.	C-1.
Deep	Moderate to high	Moderate	Moderate	Moderate	Low	Poor	Narrow	Same	B-1.
Deep	High	Moderately rapid to moderate.	Moderate	Moderate	Low	Poor	Narrow	Forest, cultivated land, pasture.	B-3.
Deep.	Moderate to high.	Same	Moderate.	Moderate.	Low	Good.	Medium	Cultivated land and pasture.	A-1.
Deep	Moderate.	Same.	Moderate.	Moderate.	Low	Good to very good.	Wide	Same	A-2.
Deep	High	Moderately rapid.	Moderate.	Moderate.	Low	Poor.	Narrow	Forest	B-3.
Deep.	Moderate to high.	Moderately rapid.	Moderate.	Moderate.	Low	Good.	Medium	Forest, cultivated land, and pasture.	A-1.
Deep	High to very high.	Moderately rapid.	Moderate.	Moderate.	Low	Poor to very poor	Very narrow.	Forest	C-1.
Deep	Moderate to high.	Moderate to rapid.	Moderate.	Moderate.	Low	Fair.	Medium	Cultivated land and pasture.	A-1.
Deep	Moderate to high.	Rapid.	Moderate.	Moderate.	Low.	Fair.	Medium	Forest, cultivated land, and pasture.	A-1.
Deep to shallow.	High.	Moderate to moderately rapid.	Moderate.	Moderate to very low.	Low	Very poor.	Very narrow.	Forest	C-1.
Deep to shallow.	High.	Moderately rapid to moderate.	Moderate.	Same	Low to very low	Poor to very poor.	Narrow to very narrow.	Forest, idle land, and pasture.	B-3.
Deep to shallow.	High	Same	Moderate	Same.	Low.	Poor.	Same.	Forest	B-3.

Principal characteristics of the soils of

Soil	Map symbol	Slope range	Parent material	Topographic position	Natural drainage	Soil profile	
						Surface soil	Subsoil
		Percent					
Madison-Grover-Louns gravelly sandy loams—Continued							
Steep phases	Mr	15–25	Same	Breaks or short very strong slopes adjacent to drainageways.	Somewhat excessive to excessive.	Same	Same
Mecklenburg gravelly clay loam, eroded hilly phase.	Ms	10–15	Residual material mainly from weathered diorite.	Short strong slopes near or along drainageways.	Same	Dark grayish-brown to reddish-brown friable gravelly clay loam.	Reddish-brown (mottled with brown and yellow) firm clay in upper part; yellow (mottled with olive-yellow) firm clay in lower part.
Mecklenburg gravelly sandy loam, eroded rolling phase.	Mt	6–10	Same	Fairly smooth interstream ridges and moderate slopes to or toward drainageways.	Good to somewhat excessive.	Dark grayish-brown friable gravelly sandy loam.	Same
Mixed alluvium:							
Poorly drained	Mw	0– 2	Young alluvial material	First bottoms; subject to overflow	Poor	Alluvial material variable in color and ranging from heavy silt loam to loose sand.	
Somewhat poorly drained	Mv	0– 2	Young alluvial material	Same	Somewhat poor	Alluvial material ranging from light-gray to dark-gray friable heavy silt loam to loose sand	
Well drained	Mu	0– 2	Young alluvial material	Same	Good	Alluvial material ranging from light-gray to dark-gray heavy silt loam to loose sand.	
Melena loamy sand.							
Eroded undulating phase	My	2– 6	Old alluvial material	High stream terraces	Somewhat excessive to excessive.	Brown very friable loamy sand in upper part, yellowish-red very friable loamy sand in lower part.	Red very friable sandy loam [2]
Light colored variant	Mx	2–10	Old alluvial material	High stream terraces	Same	Yellowish-brown very friable loamy sand grading into yellowish-brown very friable sandy loam.	Yellowish-brown friable fine sandy loam grading into brownish-yellow (mottled with red) friable fine sandy loam [2]
Riverwash	Rc	0– 3	Young alluvial material	Low first bottoms near stream banks subject to overflow.	Excessive	White to reddish-brown loose sand throughout the entire depth; new alluvial material may be deposited by stream overflow.	
Seneca fine sandy loam:							
Level phase	Sa	0– 2	Local colluvial and alluvial materials washed mainly from Appling, Cecil, and Madison soils.	Foot slopes and positions along drainageways	Good	Dark grayish-brown very friable fine sandy loam.	Grayish-brown friable fine sandy loam [1]
Undulating phase	Sb	2– 6	Same	Same	Good	Same	Same [1]
Starr loam:							
Level phase	Sc	0– 2	Local colluvial and alluvial materials washed from Lloyd, Davidson, Cecil, and Madison soils.	Same	Good	Yellowish-red friable loam	Yellowish-red friable heavy loam grading into yellowish-red (mottled with light-gray) friable loam in lower part.[3]
Undulating phase	Sd	2– 6	Same	Same	Good	Yellowish-red friable loam	Same [3]
Stony land:							
Hilly	Sf	10–15	Residual material from weathered granite, gneiss, or schist.	Short strong slopes near or along drainageways.	Somewhat excessive	Gray to yellowish-brown friable sandy loam, rock outcrops occupy about 40 to 50 percent of the surface.	Yellowish-red to red friable soil material.[3]
Rolling	Se	6–10	Same	Fairly smooth ridges and moderate slopes to or toward drainageways.	Good to somewhat excessive.	Same	Same [3]
Steep	Sg	15–25	Same	Short very strong slopes along drainageways.	Somewhat excessive to excessive.	Same	Same [3]
Unclassified city land	Uu						
Wehadkee fine sandy loam	Wa	0– 2	Young alluvial material	First bottoms; subject to overflow	Poor	Olive-gray (mottled with brown) friable fine sandy loam.	Light brownish-gray (mottled with brown and gray) friable fine sandy loam in upper part; gray (mottled with yellow and brown) friable fine sandy loam in lower part.[3]
Wehadkee silt loam	Wb	0– 2	Young alluvial material	Same	Poor	Olive-gray (mottled with brown) friable silt loam.	Light brownish-gray (mottled with brown and gray) friable silt loam in upper part; gray (mottled with yellow and brown friable silt loam in lower part.[3]

Fulton County, Georgia—Continued

Soil depth [1]	Erosion hazard	Permeability		Moisture-holding capacity	Natural fertility	Workability	Range of suitability	Principal use	Management group
		Surface soil	Subsoil						
Deep to shallow.	High to very high	Same	Moderate	Same	Low	Poor to very poor.	Very narrow	Forest	C-1
Moderately deep to deep.	High	Moderate to slow	Slow	Moderate to moderately low.	Moderate	Very poor	Very narrow	Cultivated land, pasture, idle land, and forest.	C-1.
Deep	Moderate to high	Moderate to slow	Slow	Same	Moderate	Poor	Medium	Cultivated land and pasture	A-1.
Deep; water table high.	None	Slow in upper part of soil, very slow in lower part.		Very high	Moderate	Very poor	Very narrow	Forest	B-3.
Deep; water table moderately high.	None, alluvial material deposited periodically.	Moderate in upper part of soil, slow in lower part.		Very high	Moderate	Poor	Narrow	Pasture, forest, and idle land	A-5.
Deep	Same	Moderate throughout the soil		Very high	Moderate	Fair	Medium	Pasture, forest, cultivated land, or idle land.	A-5.
Deep	None to slight	Rapid	Rapid	Low	Low	Very good	Very narrow	Cultivated land, idle land, pasture, and forest.	C-1.
Deep	Slight to moderate	Rapid	Moderately rapid	Moderately low	Low	Very good	Medium	Same	A-2.
Deep; water table high in places.	None, except stream erosion.	Rapid to very rapid throughout the soil		Low to very low	Low	Very poor	Very narrow	Forest	C-1.
Deep	None, local wash accumulates.	Moderately rapid	Moderate [2]	Moderate	Low	Good	Wide	Cultivated land and pasture	A-3.
Deep	Slight; local wash accumulates.	Moderately rapid	Moderate [2]	Moderate	Low	Good	Wide	Same	A-3.
Deep	None, local wash accumulates.	Moderate	Moderate [2]	Moderate	High	Good	Wide	Same	A-2.
Deep	Slight; local wash accumulates.	Moderate	Moderate [2]	Moderate	High	Good	Wide	Same	A-2.
Shallow to moderately deep.	High	Moderately rapid	Moderate [2]	Moderate	Low	Very poor	Very narrow	Forest	C-1.
Same	Moderate to high	Moderately rapid	Moderate [2]	Moderate	Low	Very poor	Very narrow	Forest	C-1.
Same	High to very high	Moderately rapid	Moderate [2]	Moderate	Low	Very poor	Very narrow	Forest	C-1.
Deep; water table high.	None; alluvial material deposited periodically.	Slow	Very slow	Very high	High	Poor	Narrow	Forest, pasture, and idle land	C-1. B-2.
Same	Same	Slow	Very slow	Very high	High	Very poor	Narrow	Same	B-3.

Principal characteristics of the soils of

Soil	Map symbol	Slope range	Parent material	Topographic position	Natural drainage	Soil profile	
						Surface soil	Subsoil
		Percent					
Wickham fine sandy loam:							
Eroded undulating phase	Wd	2–6	Moderately young alluvial material.	Low or moderately low stream terraces.	Good	Dark yellowish-brown to dark-red, or reddish-brown friable fine sandy loam to silt loam.	Reddish-brown firm silty clay loam grading into yellowish-red friable silty clay loam in lower part.
Undulating phase	Wc	2–6	Same	Same	Good	Dark yellowish-brown friable fine sandy loam in upper part; dark-brown friable silt loam in lower part.	Same
Wrightsboro sandy loam:							
Eroded rolling phase	Wg	6–12	Local colluvial and alluvial materials mainly, in places, partly from residual material of weathered granite or gneiss	Foot slopes and places around drainage heads and along drainageways.	Poor	Light brownish-gray loose sandy loam to pale-yellow or light yellowish-brown friable heavy sandy loam.	Light-gray (streaked with yellow) heavy sandy clay loam grading into white (mottled with pale-yellow and weak-brown) heavy sandy clay loam in lower part.
Eroded undulating phase	Wf	2–6	Same	Same	Poor	Same	Same
Undulating phase	We	2–6	Same	Same	Poor	Light brownish-gray loose sandy loam in upper part, pale-yellow (streaked with gray and brown) friable heavy sandy loam in lower [illegible]	Same

[1] The depth of the soil profile in inches to bedrock, partly weathered bedrock, or to material distinctly different from that parent to the soil, as for example, a bed of gravel. Depth classes in this county and their range in inches are as follows: Shallow, 10 to 20 inches; moder-

Fulton County, Georgia—Continued

[redacted] depth [1]	[redacted] hazard	Permeability		Moisture-holding capacity	Natural fertility	Workability	Range of suitability	Principal use	Management group
		Surface soil	Subsoil						
Deep	Slight to moderate.	Moderately rapid to moderate.	Moderate	Moderate	Moderate	Very good	Wide	Cultivated land and pasture	A-2.
Deep	Slight to moderate.	Moderately rapid	Moderate	Moderate	Moderate	Very good	Wide	Same	A-2.
Moderately deep to deep.	Moderate to high	Moderate to slow	Very slow	Moderately low	Low.	Poor	Narrow	Forest and pasture	B-4.
Same	Slight to moderate; local wash accumulates.	Moderate to slow	Very slow	Moderately low	Low	Poor	Narrow	Forest and pasture	B-4.
Deep	Same	Moderate to slow.	Very slow	Moderately low.	Low	Poor	Narrow	Forest and pasture	B-4.

ately deep 20 to 36 inches; deep, 36 to 60 inches; and very deep, 60 inches, or more.

[2] Subsurface; true subsoil generally is not present.

☆ U. S. GOVERNMENT PRINTING OFFICE: 1938—128963

SUPPLEMENT

TO THE SOIL SURVEY

OF

FULTON COUNTY, GEORGIA

REPRESENTATIVE SCENE OF FULTON COUNTY

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

A SUPPLEMENT TO THE SOIL SURVEY OF FULTON COUNTY, GEORGIA

PREPARED BY

GROVER J. THOMAS, JR., SOIL SCIENTIST

UNITED STATES DEPARTMENT OF AGRICULTURE,
SOIL CONSERVATION SERVICE

1982

CONTENTS

INTRODUCTION

The soil survey report of Fulton County was published in 1958. The primary objectives of the soil survey at that time were to meet the needs for agricultural purposes; therefore, it does not meet many of the urban needs that exist at the present time. Various properties of soils are important in determining how land can be used most safely and economically. This fact is basic to modern practice in agriculture and civil engineering and is receiving growing recognition in the field of planning. For this reason the Soil Conservation Service evaluated the soil survey report for Fulton County and decided to issue a supplemental soils report with the primary objective of meeting some of the needs of foresters, wildlife game managers, engineers, planners, and other decision makers working with the environment in evaluating the suitability of soils throughout Fulton County to accommodate land use decisions. This supplemental report has been developed to be used in conjunction with the published soil survey report.

The soils maps in the published report and the interpretative tables included in this supplemental report can serve as the basis for identifying the basic suitabilities and limitations of soils. While there are countless uses to which soils data included in this report can be put, some of the basic uses include:

- Woodland suitability.
- Use of the soils for wildlife habitat.
- Evaluation of areas for construction of houses, schools, and commercial buildings.
- Location of sources of sand, gravel, topsoil, and fill material.

o Determination of adverse soil properties, such as flood hazard, high water table, seasonal wetness and shrinking and swelling.

o Determination of site suitability for septic tank absorption fields.

Engineers should find the data helpful in serving to "red flag" potential construction problems. If soil hazards are known prior to construction, special compensating design can be prepared or alternative sites selected. Specifically, engineers can use the data in the published report and the supplemental report to identify problems associated with:

o Shrink-swell potential.

o Wetness.

o Depth to bedrock.

o Flood hazard.

o Slope.

o Ease of excavation.

On a broader basis, land use, recreation, transportation, and health related planning professional can use the reports to:

o Determine the location of roads to avoid major soil hazards as well as the location of sources of subsurface material needed in constructing highways.

o Identifying areas suitable for camp sites, golf courses, manmade fishponds, restrooms, parking areas, and many other recreational facilities.

o Study the nature of soil properties for determining the suitability of areas for absorption fields. The report indicates soil hazards that affect absorption fields, such as slow permeability caused by high clay content, presence of high water table, or excessive permeability that may allow effluent to pollute groundwater, etc.

While the uses of these reports can be extensive, there are a number of limitations which should be understood. First, the interpretations provided in this report are not a substitute for sampling and testing needed at a site chosen for a specific engineering work where extremely heavy loads are involved or at a site where excavations are to be deeper than five or six feet. Because of the scale of the photographs in the published report, small areas of soils that differ from the dominant soil may not be shown. Also, because of the scale of the photographs, soils may vary slightly from the boundaries as delineated on the maps.

HOW TO USE THIS SUPPLEMENT

This publication complements and supplements the "Soil Survey of Fulton County, Georgia" and is designed to be used in conjunction with it.

LOCATING SOILS ON THE MAPS

The soils of Fulton County are mapped on 48 individual map sheets. The maps are in the back of the published soil survey. Each sheet is numbered to correspond with a number on the index to map sheets. This index is at the front and back of the map sheets for easy reference. To locate the soil map sheet that includes the specific area in which you are interested, refer to the index to map sheets.

Each individual kind of soil is outlined and identified by a symbol on the soil map. All areas marked with the same symbol are the same kind of soil.

USING THE SOIL LEGEND TO FIND INTERPRETATIONS

The "Soil Legend" at the front and back of the map sheets in the published soil survey and page 6 of this supplement, together with the tables of interpretations in this supplement, can be used to find the soil limitations applicable to a kind of soil. This "Soil Legend" is an alphabetical list of all the symbols that appear on the soil map. The following is an example of how to go from the soil map to the tables of interpretations. If you are interested in an area of land mapped Ag, the first step is to go from the soil map to the "Soil Legend" and find the name of the soil that is shown by the symbol Ag. This soil is Appling sandy loam, eroded undulating phase. The second step is to turn to the interpretation table in this supplement giving the soil limitations for the selected land use. (See CONTENTS.)

PREPARING INTERPRETIVE MAP

Individual maps showing the limitations of the soils for various uses can be developed by using the soil map and the interpretations. The limitations can be shown visually by color coding soil maps or transparent overlays to point up the limitation of the soil for a particular use. A map or overlay can be made in this manner for each of the land uses rated. Once the interpretive map is complete, the patterns of soil limitations are readily apparent.

SOIL LEGEND

SYMBOL	NAME
Aa	Altavista fine sandy loam, level phase
Ab	Altavista fine sandy loam, undulating phase
Ac	Altavista fine sandy loam, eroded rolling phase
Ad	Appling sandy clay loam, severely eroded rolling phase
Ae	Appling sandy clay loam, severely eroded hilly phase
Af	Appling sandy loam, undulating phase
Ag	Appling sandy loam, eroded undulating phase
Ah	Appling sandy loam, rolling phase
Ak	Appling sandy loam, eroded rolling phase
Al	Appling sandy loam, hilly phase
Am	Appling sandy loam, eroded hilly phase
An	Appling sandy loam, steep phase
Ao	Augusta fine sandy loam
Ba	Buncombe loamy fine sand
Ca	Cecil clay loam, severely eroded rolling phase
Cb	Cecil clay loam, severely eroded hilly phase
Cc	Cecil clay loam, severely eroded steep phase
Cd	Cecil sandy loam, undulating phase
Ce	Cecil sandy loam, eroded undulating phase
Cf	Cecil sandy loam, rolling phase
Cg	Cecil sandy loam, eroded rolling phase
Ch	Cecil sandy loam, hilly phase
Ck	Cecil sandy loam, eroded hilly phase
Cl	Cecil sandy loam, steep phase

SYMBOL	NAME
Cm	Cecil sandy loam, eroded steep phase
Cn	Chewacla fine sandy loam
Co	Chewacla silt loam
Cp	Congaree fine sandy loam
Cr	Congaree silt loam
Da	Davidson clay loam, eroded undulating phase
Db	Davidson clay loam, eroded rolling phase
Dc	Davidson clay loam, eroded hilly phase
Ga	Grover fine sandy loam, eroded undulating phase
Gb	Grover fine sandy loam, eroded hilly phase
Gc	Gullied land
Ha	Helena sandy loam, eroded rolling phase
Hb	Hiwassee sandy loam, eroded undulating phase
Hc	Hiwassee sandy loam, eroded rolling phase
Hd	Hiwassee-Louisa soils, eroded hilly phases
Ia	Iredell stony clay loam, rolling phase
La	Lloyd clay loam, severely eroded rolling phase
Lb	Lloyd clay loam, severely eroded hilly phase
Lc	Lloyd clay loam, eroded steep phase
Ld	Lloyd gravelly sandy loam, eroded steep shallow phase
Le	Lloyd sandy loam, eroded undulating phase
Lf	Lloyd sandy loam, rolling phase
Lg	Lloyd sandy loam, eroded rolling phase
Lh	Lloyd sandy loam, hilly phase

SYMBOL	NAME
Lk	Lloyd sandy loam, eroded hilly phase
Lm	Lloyd sandy loam, steep phase
Ln	Lockhart-Cecil clay loams, severely eroded rolling phases
Lo	Lockhart-Cecil clay loams, severely eroded hilly phases
Lp	Lockhart-Cecil clay loams, severely eroded steep phases
Lr	Lockhart-Cecil sandy loams, eroded undulating phases
Ls	Lockhart-Cecil sandy loams, eroded rolling phases
Lt	Lockhart-Cecil sandy loams, hilly phases
Lu	Lockhart-Cecil sandy loams, eroded hilly phases
Lv	Lockhart-Cecil sandy loams, steep phases
Lw	Lockhart Cecil sandy loams, eroded steep phases
Lx	Louisa fine sandy loam, rolling phase
Lxa	Louisa fine sandy loam, eroded hilly phase
Lxb	Louisa fine sandy loam, steep phase
Lxc	Louisa fine sandy loam, eroded steep phase
Ly	Louisburg sandy loam, rolling phase
Lya	Louisburg sandy loam, hilly phase
Lyb	Louisburg sandy loam, steep phase
Ma	Made land
Mb	Madison clay loam, severely eroded rolling phase
Mc	Madison clay loam, severely eroded hilly phase
Md	Madison fine sandy loam, eroded undulating phase
Me	Madison fine sandy loam, rolling phase
Mf	Madison fine sandy loam, eroded rolling phase
Mg	Madison fine sandy loam, hilly phase
Mh	Madison fine sandy loam, eroded hilly phase

SYMBOL	NAME
Mk	Madison fine sandy loam, steep phase
Ml	Madison gravelly sandy loam, rolling phase
Mm	Madison gravelly sandy loam, eroded rolling phase
Mn	Madison-Grover-Louisa gravelly clay loams, severely eroded hilly phases
Mo	Madison-Grover-Louisa gravelly sandy loams, hilly phases
Mp	Madison-Grover-Louisa gravelly sandy loams, eroded hilly phases
Mr	Madison-Grover-Louisa gravelly sandy loams, steep phases
Ms	Mecklenburg gravelly clay loam, eroded hilly phase
Mt	Mecklenburg gravelly sandy loam, eroded rolling phase
Mu	Mixed alluvium, well drained
Mv	Mixed alluvium, somewhat poorly drained
Mw	Mixed alluvium, poorly drained
Mx	Molena loamy sand, light-colored variant
My	Molena loamy sand, eroded undulating phase
Ra	Riverwash
Sa	Seneca fine sandy loam, level phase
Sb	Seneca fine sandy loam, undulating phase
Sc	Starr loam, level phase
Sd	Starr loam, undulating phase
Se	Stony land, rolling
Sf	Stony land, hilly
Sg	Stony land, steep
Ua	Unclassified city land

SYMBOL	NAME
Wa	Wehadkee fine sandy loam
Wb	Wehadkee silt loam
Wc	Wickham fine sandy loam, undulating phase
Wd	Wickham fine sandy loam, eroded undulating phase
We	Worsham sandy loam, undulating phase
Wf	Worsham sandy loam, eroded undulating phase
Wg	Worsham sandy loam, eroded rolling phase

USE AND MANAGEMENT OF THE SOILS

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area. It is useful in adjusting land use, including urbanization, to the limitations and suitabilities of natural resources and the environment. Also it can help avoid soil related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, flooding, the functioning of septic tank disposal systems, and other factors affecting the suitability, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils as sites for buildings, highways, and other transportation systems, woodland, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the suitability of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey and supplement can evaluate the impact of specific land uses on the overall productivity of Fulton County or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land use pattern in harmony with the natural soil.

Health officials, highway officials, engineers, and many other specialists also can find useful information in the soil survey and supplement. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

WOODLAND MANAGEMENT AND PRODUCTIVITY

Table E contains information useful to woodland owners or forest managers planning use of soils for wood crops. Mapping unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the ordination symbol, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; and 4, moderate. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter x indicates stoniness or rockiness; w, excessive water in or on the soil; c, clay in the upper part of the soil; s, sandy texture; and r, steep slopes. The letter o indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: x, w, c, s, and r.

In table E the soils are also rated for a number of factors to be considered in management. Slight, moderate, and severe are used to indicate the degree of major soil limitations.

Ratings of the erosion hazard indicate the risk of loss of soil in well managed woodland. The risk is slight if the expected soil loss is small, moderate if some measures are needed to control erosion during logging and road construction, and severe if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of equipment limitation reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of slight indicates that use of equipment is not limited to a particular kind of equipment or time of year; moderate indicates a short seasonal limitation or a need for some modification in management or equipment; severe indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of slight indicates that the expected mortality of the planted seedlings is less than 25 percent; moderate, 25 to 50 percent; and severe, more than 50 percent.

The potential productivity of merchantable or important trees on a soil is expressed as a site index. This index is the average height, in feet, that dominant and codominant eastern cottonwoods attain at age 30, that dominant and codominant American sycamores attain at age 35, and that dominant and codominant trees of all other species attain at age 50. The site index applies to fully stocked, even aged, unmanaged stands. Common trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suitable for commercial wood production and that are suited to the soils.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
Aa, Ab Altavista	2w	Slight	Moderate	Slight	Loblolly pine Longleaf pine Shortleaf pine Sweetgum White oak	89 80 77 80 76	Loblolly pine, yellow-poplar, black walnut, sweetgum, American sycamore, cherrybark oak.
Ac Altavista	2o	Slight	Slight	Slight	Loblolly pine Yellow-poplar Southern red oak	86 100 82	Loblolly pine, yellow-poplar.
Af, Ag, Ah, Ak, Al, Am Appling	3o	Slight	Slight	Slight	Loblolly pine Shortleaf pine Scarlet oak Southern red oak White oak Yellow-poplar	82 65 68 76 71 90	Eastern redcedar, loblolly pine, yellow-poplar.
An Appling	3r	Moderate	Moderate	Slight	Loblolly pine Shortleaf pine Southern red oak Northern red oak White oak	77 69 70 68 65	Loblolly pine, shortleaf pine, yellow-poplar.
Ad, Ae Appling	3o	Slight	Slight	Slight	Loblolly pine Shortleaf pine Scarlet oak Southern red oak White oak Yellow-poplar	82 65 68 76 71 90	Eastern redcedar, loblolly pine, yellow-poplar.
Ao Augusta	2w	Slight	Moderate	Slight	Loblolly pine Longleaf pine Shortleaf pine Sweetgum White oak	89 84 77 88 ---	Loblolly pine, yellow poplar, black walnut, sweetgum, American sycamore, cherrybark oak.
Ba Buncombe	2s	Slight	Moderate	Moderate	Eastern cottonwood American sycamore Sweetgum Loblolly pine Yellow poplar	100 90 90 90 100	Eastern cottonwood, loblolly pine, American sycamore.
Cd, Ce, Cf, Cg, Ch, Ck Cecil	3o	Slight	Slight	Slight	Loblolly pine Shortleaf pine Black oak Northern red oak Post oak Scarlet oak	80 68 66 82 68 80	loblolly pine, yellow-poplar.
Cl, Cm Cecil	3r	Moderate	Moderate	Slight	Loblolly pine Shortleaf pine Black oak Northern red oak Post oak Scarlet oak	80 68 66 82 65 80	loblolly pine, yellow poplar.
Ca, Cb Cecil	4c	Moderate	Moderate	Moderate	Loblolly pine Shortleaf pine	72 66	Loblolly pine

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Cc, Cd Cecil	4c	Severe	Severe	Moderate	Loblolly pine Shortleaf pine	72 66	Loblolly pine,
Co, Cn Chewacla	1w	Slight	Moderate	Slight	Loblolly pine Yellow-poplar American sycamore Sweetgum Water oak Eastern cottonwood Green ash Southern red oak	96 104 90 97 86 100 97 90	Loblolly pine, American sycamore, yellow-poplar, sweetgum, green ash.
Cp, Cr Congaree	1o	Slight	Slight	Slight	Sweetgum Yellow-poplar Cherrybark oak Loblolly pine Eastern cottonwood American sycamore Black walnut Scarlet oak Willow oak	98 107 107 90 107 89 100 100 95	Loblolly pine, yellow-poplar, American sycamore, black walnut, cherrybark oak, eastern cottonwood, sweetgum.
Da, Db, Dc Davidson	3c	Moderate	Slight	Slight	Loblolly pine Shortleaf pine Northern red oak Southern red oak Sweetgum White oak Yellow-poplar	81 68 86 74 80 71 86	Loblolly pine, yellow-poplar.
Ga, Gb Grover	3o	Slight	Slight	Slight	Loblolly pine White oak Southern red oak	80 ---	Loblolly pine,
Gc, [illegible] Gullied land**							
Ha Helena	3w	Slight	Moderate	Slight	Loblolly pine Shortleaf pine White oak Yellow-poplar	85 63 64 87	Loblolly pine, yellow-poplar.
Hb, Hc Hiwassee	3o	Slight	Slight	Slight	Loblolly pine Northern red oak Shortleaf pine White oak Yellow-poplar	82 70 76 70 86	Loblolly pine, yellow poplar,
Hd*: Hiwassee	3o	Slight	Slight	Slight	Loblolly pine Northern red oak Shortleaf pine White oak Yellow-poplar	82 70 76 70 86	Loblolly pine, yellow poplar,
Lovisa	4o	Slight	Slight	Slight	Loblolly pine Shortleaf pine Southern red oak Yellow-poplar Longleaf pine	75 65 76 85 67	Loblolly pine, eastern redcedar.

See footnote at end of table.

** See Cc, Cecil, for interpretation.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
Iredell	8x	Slight	Severe	Slight	Loblolly pine	75	Eastern redcedar, loblolly pine,
					Post oak	79	
					Shortleaf pine	61	
					Sweetgum	82	
					Southern red oak	76	
					Blackjack oak	---	
					White oak		
					Shagbark hickory	---	
					Eastern redcedar	---	
Le, Lf, Lg, Lh, Lk Lloyd	3o	Slight	Slight	Slight	Loblolly pine	76	Loblolly pine, shortleaf pine, yellow-poplar.
					Shortleaf pine	70	
					Yellow poplar	86	
Ld, Lm Lloyd	3r	Moderate	Moderate	Slight	Loblolly pine	76	Loblolly pine, shortleaf pine, yellow-poplar.
					Shortleaf pine	70	
					Yellow-poplar	86	
La, Lb, Ln, Lo Lloyd	4c	Moderate	Moderate	Moderate	Loblolly pine	75	Loblolly pine, shortleaf pine, yellow poplar.
					Shortleaf pine	60	
					Yellow-poplar	85	
Lc Lloyd	4c	Severe	Severe	Severe	Loblolly pine	75	Loblolly pine, shortleaf pine, yellow-poplar.
					Shortleaf pine	60	
					Yellow-poplar	85	
Lr*, Ls*, Lt*, Lo* Cecil	3o	Slight	Slight	Slight	Loblolly pine	80	loblolly pine, yellow poplar.
					Shortleaf pine	68	
					Black oak	66	
					Northern red oak	82	
					Post oak	68	
					Scarlet oak	80	
Lv*, Lw* Cecil	3r	Moderate	Moderate	Slight	Loblolly pine	80	loblolly pine, yellow-poplar.
					Shortleaf pine	68	
					Black oak	66	
					Northern red oak	82	
					Post oak	68	
					Scarlet oak	80	
Lp* Cecil	4c	Severe	Severe	Moderate	Loblolly pine	72	Loblolly pine,
					Shortleaf pine	66	
LxB, LxC Louisa	4r	Moderate	Moderate	Slight	Loblolly pine	75	Loblolly pine.
					Shortleaf pine	65	
					Southern red oak	60	
					Yellow-poplar	85	
					White oak	60	
LxA, Lx Louisa	4o	Slight	Slight	Slight	Loblolly pine	75	Loblolly pine.
					Shortleaf pine	65	
					Southern red oak	60	
					Yellow poplar	85	
					White oak	60	
LyB Louisburg	3r	Moderate	Moderate	Slight	Loblolly pine	80	Loblolly pine,
					Shortleaf pine	66	
					Southern red oak	72	yellow poplar.
					Yellow poplar	84	
					White oak	68	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
LyA, Ly---------- Louisburg	3o	Slight	Slight	Slight	Loblolly pine--------	80	Loblolly pine, yellow-poplar.
					Shortleaf pine-------	70	
					Southern red oak-----	72	
					Yellow-poplar--------	84	
					White oak-----------	68	
Md, Me, Mf, Mg, Mh- Madison	3o	Slight	Slight	Slight	Loblolly pine--------	77	Loblolly pine, longleaf pine, yellow-poplar.
					Longleaf pine--------	63	
					Shortleaf pine-------	66	
					Southern red oak-----	81	
					Yellow-poplar--------	92	
Mk---------- Madison	3r	Moderate	Moderate	Slight	Loblolly pine --------	77	Loblolly pine, longleaf pine, yellow-poplar.
					Longleaf pine--------	63	
					Shortleaf pine-------	66	
					Southern red oak-----	81	
					Yellow-poplar--------	92	
Ml, Mm---------- Madison	3o	Slight	Slight	Slight	Loblolly pine --------	77	Loblolly pine, longleaf pine, yellow-poplar.
					Longleaf pine--------	63	
					Shortleaf pine-------	66	
					Southern red oak-----	81	
					Yellow-poplar--------	92	
Mn, Mo---------- Madison	4c	Moderate	Moderate	Moderate	Loblolly pine --------	72	Eastern redcedar, loblolly pine,
					Shortleaf pine-------	66	
					Longleaf pine--------	60	
Mp*, Mr*: Madison----------	3o	Slight	Slight	Slight	Loblolly pine --------	77	Loblolly pine, longleaf pine, yellow-poplar.
					Longleaf pine--------	63	
					Shortleaf pine-------	66	
					Southern red oak-----	81	
					Yellow-poplar--------	92	
Grover----------	3o	Slight	Slight	Slight	Loblolly pine --------	80	Loblolly pine.
					White oak-----------	---	
					Southern red oak-----	---	
Louisa----------	4o	Slight	Slight	Slight	Loblolly pine--------	70	Loblolly pine.
					Shortleaf pine-------	67	
					Southern red oak-----	60	
					Yellow-poplar--------	85	
					White oak-----------	60	
Mr*: Madison----------	3r	Moderate	Moderate	Slight	Loblolly pine--------	77	Loblolly pine, longleaf pine, yellow-poplar.
					Longleaf pine--------	63	
					Shortleaf pine ------	66	
					Southern red oak-----	81	
					Yellow-poplar--------	92	
Grover----------	3r	Moderate	Moderate	Slight	Loblolly pine--------	80	Loblolly pine,
					White oak-----------	---	
					Southern red oak ----	--	
Louisa----------	4r	Moderate	Moderate	Slight	Loblolly pine--------	70	Loblolly pine.
					Shortleaf pine-------	67	
					Southern red oak-----	60	
					Yellow-poplar--------	85	
					White oak-----------	60	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity		
	Ordination symbol	Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	Trees to plant
Ma*:							
Madison	3o	Slight	Slight	Slight	Loblolly pine	77	Loblolly pine, longleaf pine, yellow-poplar.
					Longleaf pine	69	
					Shortleaf pine	66	
					Southern red oak	81	
					Yellow-poplar	92	
Grover	3o	Slight	Slight	Slight	Loblolly pine	80	Loblolly pine.
					White oak	---	
					Southern red oak	---	
Louisa	4o	Slight	Slight	Slight	Loblolly pine	70	Loblolly pine.
					Shortleaf pine	67	
					Southern red oak	60	
					Yellow-poplar	85	
					White oak	60	
Mt, Ms	4o	Slight	Slight	Slight	Loblolly pine	75	Loblolly pine, yellow-poplar, eastern redcedar.
Mecklenburg					Shortleaf pine	67	
					Southern red oak	75	
					Sweetgum	82	
					White oak	68	
					Yellow-poplar	89	
					Eastern redcedar		
Na	1o	Slight	Slight	Slight	Loblolly pine	96	Loblolly pine, yellow-poplar, American sycamore, cherrybark oak.
Mixed alluvium					Yellow-poplar	107	
					Sweetgum	96	
					Southern red oak	80	
Ny	2w	Slight	Moderate	Slight	Loblolly pine	95	Loblolly pine, sweetgum, yellow-poplar, water oak, American sycamore, eastern cottonwood.
Mixed alluvium					Sweetgum	95	
					Yellow-poplar	105	
					Water oak	85	
					Southern red oak	85	
Nw	1w	Slight	Severe	Severe	Loblolly pine	99	Loblolly pine, American sycamore, yellow-poplar, green ash, sweetgum, eastern cottonwood, cherrybark oak.
Mixed alluvium					Sweetgum	100	
					Yellow-poplar	106	
					Willow oak	98	
					Green ash	96	
					Water oak	86	
					White ash	88	
Ny, Nx	3s	Slight	Moderate	Moderate	Loblolly pine	80	Loblolly pine, slash pine.
Nolena					Northern red oak	86	
					White oak	68	
					Shortleaf pine	70	
					Water oak	80	
Ra	2s	Slight	Moderate	Moderate	Eastern cottonwood	100	Eastern cottonwood, loblolly pine, American sycamore.
Riverwash					American sycamore	90	
					Sweetgum	90	
					Loblolly pine	90	
					Yellow poplar	100	
Sb, Sa	1o	Slight	Slight	Slight	Loblolly pine	96	Loblolly pine, yellow poplar, American sycamore, cherrybark oak.
Seneca					Yellow-poplar	107	
					Sweetgum	96	
					Southern red oak	80	
Sd, Sc	1o	Slight	Slight	Slight	Loblolly pine	96	Loblolly pine, yellow-poplar, American sycamore, cherrybark oak.
Starr					Yellow poplar	107	
					Sweetgum	96	
					Southern red oak	80	

See footnote at end of table.

TABLE E.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Se Stony land rolling	3x	Moderate	Moderate	Moderate	Loblolly pine Shortleaf pine	70 70	Loblolly pine,
Sf Stony land hilly	3x	Moderate	Moderate	Moderate	Loblolly pine Shortleaf pine	70 70	Loblolly pine,
Sg Stony land steep	3x	Moderate	Moderate	Moderate	Loblolly pine Shortleaf pine	70 70	Loblolly pine,
Wh, Wa Wehadkee	1w	Slight	Severe	Severe	Loblolly pine Sweetgum Yellow-poplar Willow oak Green ash Water oak White ash	96 100 106 90 96 86 88	Loblolly pine, American sycamore, yellow poplar, green ash, sweetgum, eastern cottonwood, cherrybark oak.
Wc, Wd Wickham	2o	Slight	Slight	Slight	Loblolly pine Yellow-poplar Southern red oak	86 100 82	Loblolly pine, yellow poplar.
We, Wf, Wg Worsham	2w	Slight	Severe	Severe	Northern red oak Loblolly pine Yellow-poplar	80 88 96	Loblolly pine, sweetgum, yellow poplar.

* See description of the map unit for composition and behavior characteristics of the map unit.

ENGINEERING

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, and builders and contractors.

The ratings in the engineering tables are based on test data and estimated data in the SOIL PROPERTIES section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by the soil survey and used in determining the ratings in this section were grain size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material, where pertinent. Data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, and topsoil; (7) plan drainage systems, irrigation systems, ponds, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built to that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

The information is presented mainly in tables. Table M shows, for each kind of soil, the degree and kind of limitations for building site development, and table L, for sanitary facilities. Table N indicates, as appropriate, suitability or probability for construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this supplement, can be used to make additional interpretations and to construct interpretive maps for specific uses of land. (See PREPARING INTERPRETIVE MAP, page 5 .)

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the GLOSSARY.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping are indicated in table M. A slight limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A moderate limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A severe limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, cemeteries, and other purposes. Such digging or trenching is influenced in some soils by soil wetness caused by a seasonal high water table; the clayey texture of some soils; the tendency of some soils to cave in or slough; and the presence of bedrock or large stones in some soils. In addition, excavations in some soils are affected by slope and the probability of flooding. Ratings do not apply to soil horizons below a depth of 5 feet. The ratings of soils in Fulton County for shallow excavations are especially important and are applicable to excavations to be used for utilities.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of a very firm horizon, usually difficult to excavate, is indicated.

Dwellings and small commercial buildings referred to in table M are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table M have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of the soil are important in design and construction of roads and streets. Soil strength, as inferred from the engineering classification of the soil, shrink-swell potential, and depth to a high water table are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock, and content of large stones affect stability and ease of excavation.

Lawns and landscaping require soils that are suitable for the establishment and maintenance of turf for lawns and ornamental trees and shrubs for landscaping. The best soils are firm after rains and absorb water readily and hold sufficient moisture for plant growth. The surface layer should be free or nearly free of stones. If shaping is required, the soils should be thick enough over bedrock to allow for necessary grading. In rating the soils, the availability of water for sprinkling is assumed. The ratings of the soils in table M for lawns and landscaping are also applicable to vegetable gardens. The best soils for lawns and landscaping are also the best soils for vegetable gardens. Soil reaction, a high water table, depth to bedrock, the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

TABLE 8.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Aa, Ab Altavista	Severe: wetness,	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.	Moderate: wetness.
Ac Altavista	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
Af, Ag Appling	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
Ah, Ak, Al, Am Appling	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope.
An Appling	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ad, Ae Appling	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope.
Ao Augusta	Severe: wetness,	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.	Moderate: wetness.
Ba Bancombe	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Severe: droughty.
Cd, Ce Cecil	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
Cf, Cg, Ch, Ck Cecil	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.	Moderate slope
Cl, Cm Cecil	Severe: slope.	Severe: slope.	Severe. slope.	Severe: slope.	Severe: slope.	Severe slope
Ca, Cb Cecil	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.	Moderate slope
Cc Cecil	Severe, slope.	Severe: slope.	Severe, slope.	Severe: slope.	Severe: slope.	Severe slope
Co, Cn Chewacla	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
Cp, Cr Congaree	Moderate wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Da Davidson	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Moderate low strength.	Slight.
Db, Dc Davidson	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate low strength. slope	Moderate: slope.
Ga Grover	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
Gb Grover	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.

TABLE 8.--BUILDING SITE DEVELOPMENT -Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Gc Gullied land	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.	Moderate slope
Ha Helena	Severe: wetness.	Severe: shrink swell.	Severe: wetness, shrink swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: wetness, slope.
Hb Hiwassee	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
Hc Hiwassee	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
Hd*: Hiwassee	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
Louisa	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
Ir Iredell	Severe: depth to rock.	Moderate: depth to rock, shrink swell, slope.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, large stones, slope.	Moderate: slope, large stones.
La Lloyd	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
Lf, Lg, Lh, Lk Lloyd	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope	Moderate: slope.
Lm Lloyd	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
La, Lb Lloyd	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate low strength, slope.	Moderate: slope.
Lc Lloyd	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ld Lloyd	Severe slope.	Severe. slope.	Severe. slope.	Severe: slope.	Severe: slope	Severe. slope.
Lr* Cecil	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
Ls*, Lt*, Lu* Cecil	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope.
Lv*, Lw* Cecil	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope
Lx*, Lz* Cecil	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.	Moderate slope
Lp* Cecil	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe slope
LrB, LrC Louisa	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe. slope.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
LxA, Lx Louisa	Moderate: depth to rock.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
LyB Louisburg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
LyA, Ly Louisburg	Moderate: depth to rock, slope.	Moderate. slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, slope, droughty.
Ma*. Made land						
Md Madison	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
Me, Mf, Mg, Mh Madison	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope.
Mk Madison	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ml, Mm Madison	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe. slope.	Moderate: slope, low strength.	Moderate: small stones, slope.
Mb, Mc Madison	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate. slope, low strength.	Moderate: slope.
Mo*, Mp*: Madison	Moderate: too clayey, slope.	Moderate. slope.	Moderate. slope.	Severe. slope.	Moderate: slope, low strength.	Moderate: small stones, slope.
Grover	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
Louisa	Moderate: depth to rock.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
Mr*: Madison	Severe: slope.	Severe: slope.	Severe: slope.	Severe. slope.	Severe: slope.	Severe: slope.
Grover	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Louisa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ms*: Madison	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.	Moderate: small stones, slope.
Grover	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
Louisa	Moderate: depth to rock.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.

See footnote at end of table.

TABLE 4.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Mt, Ms---------- Mecklenburg	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Severe: small stones.
Mu ---------- Mixed alluvium	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Mv---------- Mixed alluvium	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: flooding.
Mw ---------- Mixed alluvium	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
My, Mx---------- Molena	Severe: cutbanks cave.	Slight ----------	Slight----------	Moderate: slope.	Slight----------	Moderate: droughty.
Ra---------- Riverwash	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Severe: droughty.
Sb, Sa---------- Seneca	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight.
Sd, Sc---------- Starr	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight.
Se---------- Stony land rolling	Moderate: slope, large stones	Moderate: large stones, slope	Moderate large stones slope.	Severe: slope.	Moderate: slope, large stones.	Moderate slope, large stones
Sf---------- Stony land hilly	Moderate: slope, large stones.	Moderate: large stones, slope.	Moderate: large stones, slope.	Severe: slope.	Moderate: slope, large stones	Moderate slope, large stones.
Sg---------- Stony land steep	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe slope.
Ua*. Unclassified city land						
Wb, Wa ---------- Wehadkee	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
Wc, Wd---------- Wickham	Slight----------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
We, Wf, Wg---------- Worsham	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table L shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as slight, soils are generally favorable for the specified use and limitations are minor and easily overcome; if moderate, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if severe, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms good, fair, or poor, which respectively, parallels the terms slight, moderate, and severe.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and feasures that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion is a hazard if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy subsoil, have moderate permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy soils generally have rapid permeability which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

The limitations in table L apply only to the soil material within a depth of about 5 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy and free of stones or boulders are better than other soils. Clayey soils may be sticky, difficult to spread, and hard to pack.

The soils selected for final cover of landfills should be suitable for growing plants. The surface layer in most soils has the best workability, the most organic matter, and the best potential for growing plants. Thus, for either the area or trench type landfill, stockpiling material from the surface layer for use as the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

TABLE 1. SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Aa, Ab Altavista	Severe: wetness.	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
Ac Altavista	Moderate: slope.	Severe: slope.	Severe: seepage.	Moderate: slope.	Fair: slope, too clayey
Af, Ag Appling	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, hard to pack.
Ah, Ak, Al, Am Appling	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
An Appling	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ao, Ap Appling	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
Aq Augusta	Severe: wetness.	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
Ba Buncombe	Severe: poor filter.	Severe: seepage, flooding.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Cd, Ce Cecil	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, hard to pack.
Cf, Cg, Ch, Ck Cecil	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
Cl, Cm Cecil	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ca, Cb Cecil	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
Cc Cecil	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Co, Cn Chewacla	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Cp, Cr Congaree	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Da Davidson	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, hard to pack.

TABLE L.-- SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ph, Dc Davidson	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
Ga Grover	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Gb Grover	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Gc Gullied land	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
Ha Helena	Severe: wetness, percs slowly.	Severe: slope, wetness	Severe: wetness, too clayey.	Moderate: wetness,	Poor: too clayey, hard to pack.
Hb Hiwassee	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, hard to pack.
Hc Hiwassee	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
Hd*: Hiwassee	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
Louisa	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope.
IA Iredell	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Le Lloyd	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Lf, Lg, Lh, Lk Lloyd	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Ln Lloyd	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
La, Lb Lloyd	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Lc Lloyd	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ld Lloyd	Severe slope.	Severe: slope.	Severe slope	Severe slope	Poor slope.

See footnote at end of table.

TABLE 1. SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Lr* Cecil	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, hard to pack.
Ls*, Lt*, Lu* Cecil	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
Lv*, Lw* Cecil	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ln*, Lo* Cecil	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
Lp* Cecil	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
LxB, LxC Louisa	Severe: slope, depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: area reclaim slope.
LxA, Lz Louisa	Severe depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: area reclaim.
LyB Louisburg	Severe slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: slope, thin layer.
LyA, Ly Louisburg	Moderate: depth to rock, slope.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer.
Ma*. Made Land					
Md Bodison	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Me, Mf, Mg, Mh Madison	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
Mk Madison	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ml, Mm, Mn, Mc Madison	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
Mo*, Mp*: Madison	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
Grover	Moderate. slope.	Severe: slope.	Moderate: slope.	Moderate. slope.	Fair: slope.

See footnote at end of table.

TABLE L.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Mo*, Mp*: Louisa	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: area reclaim.
Mr*: Madison	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Grover	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Louisa	Severe: slope, depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, slope.
Ms*: Madison	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
Grover	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Louisa	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: area reclaim.
Mt, Mu: Mecklenburg	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Mv: Mixed alluvium	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Good.
Mw: Mixed alluvium	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness.
Mx: Mixed alluvium	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
My, Mx: Molena	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
Ra: Riverwash	Severe: poor filter.	Severe: seepage, flooding.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Sb, Sa: Seneca	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Good.
Sd, Sc: Starr	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Good.
Se: Stony land rolling	Moderate: slope large stones.	Severe: slope.	Moderate: large stones	Moderate: slope	Fair: slope, large stones

See footnote at end of table.

TABLE L.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Sf Stony land hilly	Moderate: slope, large stones.	Severe: slope.	Moderate: large stones.	Moderate: slope.	Fair: slope, large stones.
Sg Stony land steep	Severe: slope.	Severe: slope.	Moderate: slope, large stones.	Severe: slope.	Poor: slope.
Ua*. Unclassified city land					
Wb, Wa Wehadkee	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Wc, Wd Wickham	Moderate: flooding.	Severe: flooding.	Severe: seepage.	Moderate: flooding.	Fair: too clayey.
We, Wf Worsham	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey.
Wg Worsham	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

Construction materials

Each soil is rated as a source of roadfill, sand, gravel, and topsoil and indicated in table N by ratings as appropriate, of good, fair, or poor; or probable or improbable. Each soil is evaluated to the depth observed, generally about 5 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series in the 1958 published soil survey.

The ratings apply to the soil material between the surface layer and a depth of 5 feet. It is assumed that soil layers will be mixed during excavation and spreading. Many soils have layers of contrasting suitability within their profile. The estimated engineering properties in table H provide specific information about the nature of each layer. This information can help determine the suitability of each layer for roadfill.

Soils rated good contain significant amounts of sand or gravel or both. They have low shrink-swell potential and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated fair have plasticity index of less than 10 and have other limiting features, such as moderate shrink-swell potential, slopes of 15 to 25 percent, wetness, or many stones. Soils rated poor have a plasticity index of more than 10, a high shrink-swell potential, and many stones. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table N provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil that is a probable source of sand or gravel has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 5 feet. Coarse fragments of soft bedrock material are not considered to be sand and gravel. Loamy and clayey soils are commonly not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Grain size is given in table H.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plant-life is determined by texture and structure. Organic matter in the surface layer greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from this layer should be carefully preserved for later use.

Soils rated good have friable loamy material at least to a depth of 40 inches. They are essentially free of stones and cobbles, are low in content of gravel, and nearly level to rolling. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated fair are sandy, or they are loamy or clayey, and the suitable material is only 20 to 40 inches thick; or they have appreciable amounts of stones; or they are hilly.

Soils rated poor are very sandy or clayey; or they have suitable layers less than 20 inches thick; or they have large amounts of stones; or they are steep; or they are poorly drained.

Although a rating of good is not based entirely on high content of organic matter, a surface layer is generally preferred for topsoil because of its organic matter content. This layer or horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

TABLE 8. CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Aa, Ab Altavista	Fair: wetness,	Improbable: excess fines.	Improbable: excess fines.	Good.
Ac Altavista	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Af, Ag, Ah, Ak, Al, Am Appling	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
An Appling	Poor low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ad, Ae Appling	Poor. low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ao Augusta	Fair: wetness,	Improbable: excess fines.	Improbable: excess fines.	Good.
Ba Buncombe	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Cd, Ce, Cf, Cg, Ch, Ck Cecil	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Cl, Cm Cecil	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ca, Cb Cecil	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Cc Cecil	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Co, Cn Chewacla	Poor: low strength,	Improbable: excess fines.	Improbable: excess fines.	Good
Cp, Cr Congaree	Fair: low strength,	Improbable: excess fines.	Improbable: excess fines.	Good.
Da, Db, Dc Davidson	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ga Grover	Fair: low strength,	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer
Gb Grover	Fair: low strength,	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, thin layer.
Gc Gullied land	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ha Helena	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

TABLE N.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Hb, Hc Hiwassee	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Hd*: Hiwassee	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Louisa	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Ir Iredell	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, large stones, area reclaim.
Le, Lf, Lg, Lh, Lk Lloyd	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Lm Lloyd	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
La, Lb Lloyd	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Lc Lloyd	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Ld Lloyd	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Lr*, Ls*, Lt*, Lu* Cecil	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Lv*, Lw* Cecil	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Ln*, Lo* Cecil	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Lp* Cecil	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
LrB, LrC Louisa	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
LrA, Lr Louisa	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
LyB Louisburg	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
LyA, Ly Louisburg	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ma*. Made land				
Md, Me, Mf, Mg, Mh Madison	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

See footnote at end of table.

TABLE 8.--CONSTRUCTION MATERIALS Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ar Madison	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Ml, Ma, Mb, Mc Madison	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Mo*, Mp*: Madison	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Grover	Fair: low strength,	Improbable: excess fines.	Improbable. excess fines.	Fair: slope, thin layer.
Louisa	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Mr*: Madison	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Grover	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Louisa	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Ms*: Madison	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Grover	Fair: low strength,	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, thin layer.
Louisa	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Mt, Mu Mecklenburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor thin layer.
Mw Mixed alluvium	Good	Improbable. excess fines.	Improbable: excess fines.	Good.
My Mixed alluvium	Fair: wetness.	Probable	Improbable: too sandy.	Fair: thin layer
Mw Mixed alluvium	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
My, Mx Molena	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Na Riverwash	Good	Probable	Improbable. too sandy.	Poor: too sandy.
Sb, Sa Seneca	Good	Improbable: excess fines	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE N.--CONSTRUCTION MATERIALS -Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Sd, Sc---------- Starr	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
Se---------- Stony land rolling	Fair large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, thin layer.
Sf---------- Stony land hilly	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, thin layer.
Sg---------- Stony land steep	Fair: slope, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope, thin layer
Ua*. Unclassified city land				
Wb, Wa---------- Wehadkee	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Wc, Wd---------- Wickham	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
We, Wf, Wg---------- Worsham	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, thin layer.

* See description of the map unit for composition and behavior characteristics of the map unit.

RECREATION

The soils of Fulton County are rated in table G according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. Slight means that the soil properties are generally favorable and that the limitations are minor and easily overcome. Moderate means that the limitations can be overcome or alleviated by planning, design, or special maintenance. Severe means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table G can be supplemented by information in other tables of this supplement. Especially helpful are interpretations for septic tank absorption fields, given in table L, interpretations for dwellings without basements and for local roads and streets, given in table M, and interpretations for construction materials, given in table N.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use are nearly level to rolling and are not wet or subject to flooding during the period of use. The surface soil has few or no stones or boulders, and it absorbs rainfall readily but remains firm. Hilly and steep soils, and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for this use are nearly level to rolling and are not wet or subject to flooding during the period of use. Hilly and steep soils, and stones or boulders will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are nearly level and are not wet or subject to flooding during the season of use. The surface soil is free or nearly free of stones or boulders and is firm after rains. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, and are not subject to frequent flooding. They are nearly level to rolling and have few or no stones or boulders in the surface layer.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are nearly level to rolling, not wet, and are not subject to flooding during the

period of use. They should have a surface layer that is free or nearly free of stones and boulders. Suitability of the soil for traps, trees, or greens was not considered in rating the soils. Irrigation is an assumed management practice.

TABLE G.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Aa Altavista	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Ab Altavista	Severe: flooding.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
Ac Altavista	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Af, Ag Appling	Slight	Slight	Moderate: slope.	Slight	Slight.
Ah, Ak, Al, Am Appling	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
An Appling	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Ad, Ae Appling	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Ao Augusta	Severe: flooding.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
Ba Buncombe	Severe: flooding.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Severe: droughty.
Cd, Ce Cecil	Slight	Slight	Moderate: slope.	Slight	Slight.
Cf, Cg, Ch, Ck Cecil	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Cl, Cm Cecil	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Ca, Cb Cecil	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Cc Cecil	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Cu, Cv Chewacla	Severe: flooding, wetness.	Moderate: wetness, flooding.	Severe: wetness, flooding.	Moderate: flooding, wetness	Severe: flooding.
Cp, Cr Congaree	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Da Davidson	Slight	Slight	Moderate: slope.	Slight	Slight.
Db, Dc Davidson	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Ga Grover	Slight	Slight	Moderate: slope.	Slight	Slight.

TABLE G. RECREATIONAL DEVELOPMENT Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Gb Grover	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
GC Gullied land	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope
Ha Helena	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Moderate: wetness.	Moderate: wetness, slope.
Hb Hiwassee	Slight	Slight	Moderate: slope.	Slight	Slight.
Hc Hiwassee	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Hd*: Hiwassee	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Louisa	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Ir Iredell	Moderate: slope small stones, percs slowly	Moderate. slope, small stones, percs slowly.	Severe: slope, small stones.	Slight	Moderate: slope, large stones.
Le Lloyd	Slight	Slight	Moderate: slope,	Slight	Slight.
Lf, Lg, Lh, Lk Lloyd	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Ln Lloyd	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
La, Lb Lloyd	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Lc Lloyd	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Ld Lloyd	Severe: slope	Severe slope	Severe: slope.	Moderate slope	Severe slope
Lr* Cecil	Slight	Slight	Moderate: slope,	Slight	Slight
Ls*, Lt*, Lu* Cecil	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Slight
Lv*, Lw* Cecil	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe slope
Ln*, Lo* Cecil	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate. slope.
Lp* Cecil	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe slope.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LxB, LxC Louisa	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
LxA, Lx Louisa	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
LyB Louisburg	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
LyA, Ly Louisburg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope, droughty.
Ma*. Made land					
Md Madison	Slight	Slight	Moderate: slope.	Slight	Slight.
Me, Mf, Mg, Mh Madison	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Mk Madison	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Ml, Mm Madison	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
Mb, Mc Madison	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Mo*, Mp*: Madison	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
Grover	Moderate: slope, small stones	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: slope, small stones
Louisa	Moderate: small stones, slope.	Moderate: small stones, slope.	Severe: slope, small stones.	Slight	Moderate: slope.
Mr*: Madison	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Grover	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Louisa	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Ms*: Madison	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
BnB:					
Grover	Moderate: slope, small stones	Moderate: slope, small stones	Severe: slope, small stones	Slight	Moderate: slope.
Louisa	Moderate: small stones, slope.	Moderate: small stones, slope.	Severe: slope, small stones.	Slight	Moderate: slope.
Mt, Ms Mecklenburg	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones.
Mu Mixed alluvium	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Mv Mixed alluvium	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding	Severe: flooding.
Mw Mixed alluvium	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
My Molena	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
Mx Molena	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty.
Ra Riverwash	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Sb Seneca	Moderate: wetness.	Slight	Moderate: slope	Slight	Slight.
Sa Seneca	Moderate: wetness.	Slight	Slight	Slight	Slight.
Sd Starr	Moderate: wetness.	Slight	Moderate: slope	Slight	Slight.
Sc Starr	Moderate: wetness.	Slight	Slight	Slight	Slight.
Se Stony land rolling	Moderate slope, large stones.	Moderate slope, large stones	Severe: slope, large stones.	Moderate large stones.	Moderate. large stones, slope.
Sf Stony land hilly	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope, large stones.	Moderate: large stones.	Moderate: large stones slope
Sg Stony land steep	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Moderate: slope.	Severe. slope
Ua*. Unclassified city land					
Wb, Wa Wehadkee	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe. wetness, flooding.

See footnote at end of table.

TABLE 6. -RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Wc, Wd---------- Wickham	Severe: flooding.	Slight	Moderate: slope.	Slight----------	Slight.
We, Wf---------- Worsham	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Wg---------- Worsham	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

WILDLIFE HABITAT

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area. If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation and by maintaining the desirable plants.

In table F, the soils in Fulton County are rated according to their potential to support the main kinds of wildlife habitat. This information can be used in planning for parks and wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of good means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of fair means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of poor means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of very poor means that restrictions for the element of wildlife habitat or kind of wildlife are

very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, sorghum, wheat, oats, millet, cowpeas, soybeans, sunflowers, and barley.

Grasses and legumes are domestic grasses and legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, oats, soybeans, lovegrass, rye, and clover.

Wild herbaceous plants are native or naturally established grasses, legumes, and forbs that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, indiangrass, pokeweed, partridgepea, and fescue.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of native plants are oak, yellow poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit producing shrubs that are commercially available and suitable for planting on soils rated good are Russian olive, autumn olive, and crabapple.

Coniferous plants are cone bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, cedar, and juniper.

Wetland plants are annual and perennial vegetation common to moist or wet sites. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. A dependable water supply is important if water areas are to be developed and managed. Examples of shallow water areas are waterfowl feeding areas and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, cottontail rabbit, and red fox.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes and wild herbaceous plants. Examples of wildlife attracted to these areas include woodcock, thrushes, woodpeckers, squirrels, fox, racoon, and deer.

Wetland habitat consists of open, swampy, shallow water areas where water tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, muskrat, mink, and beaver.

TABLE F.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Aa Altavista	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ab Altavista	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ac Altavista	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Af, Ag Appling	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ah, Ak, Al, Am Appling	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
An Appling	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ad, Ae Appling	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Ao Augusta	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ba Buncombe	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Cd, Ce Cecil	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Cf, Cg, Ch, Ck Cecil	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Cl, Cm Cecil	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ca, Cb Cecil	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Cc Cecil	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Co, Cn Chewacla	Very poor.	Poor	Poor	Good	Good	Fair	Fair	Poor	Good	Fair.
Cp, Cr Congaree	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Da Davidson	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Poor.
Db, Dc Davidson	Fair	Good	Good	Good	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Ga Grover	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Gb Grover	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Gc Gullied land	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ha Helena	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Hb Hiwassee	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Hc Hiwassee	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Hd*: Hiwassee	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Louisa	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
IA Iredell	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.
Le, Lf, Lg Lloyd	Fair	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Lh, Lk Lloyd	Poor	Fair	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Ll Lloyd	Very poor.	Poor	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
La Lloyd	Poor	Poor	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Lb Lloyd	Very poor.	Poor	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Lc Lloyd	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Ld Lloyd	Very poor.	Poor	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Lr* Cecil	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ls*, Lt*, Lu* Cecil	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Lv*, Lw* Cecil	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ln*, Lo* Cecil	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Lp* Cecil	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
LrB, LrC Louisa	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
LrA, Lr Louisa	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
LyB Louisburg	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
LyA, Ly Louisburg	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.

See footnote at end of table.

TABLE F.--WILDLIFE HABITAT POTENTIALS Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ma*. Made land										
Md----- Madison	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Me, Mf, Mg, Mh----- Madison	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Mk----- Madison	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Ml, Mm----- Madison	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Mb, Mc----- Madison	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Mo*, Mp*: Madison-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Grover-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Louisa-----	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Mr*: Madison-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Grover-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Louisa-----	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Ms*: Madison-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Grover-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Louisa-----	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Mt, Mu----- Mecklenburg	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Mv----- Mixed alluvium	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Mw----- Mixed alluvium	Poor	Fair	Fair	Good	Good	Fair	Poor	Fair	Good	Fair.
Mx----- Mixed alluvium	Very poor.	Poor	Poor	Fair	Fair	Good	Fair	Poor	Fair	Fair.
My, Mz----- Molena	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Na Riverwash	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

See footnote at end of table.

TABLE F. WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Sb, Sa Seneca	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Sd, Sc Starr	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Se Stony land rolling	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
Sf Stony land hilly	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Sg Stony land steep	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Ua*. Unclassified city land										
Wb, Wa Wehadkee	Very poor.	Poor	Poor	Fair	Fair	Good	Fair	Poor	Fair	Fair.
Wc, Wd Wickham	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
We, Wf Worsham	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Wg Worsham	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor

* See description of the map unit for composition and behavior characteristics of the map unit.

GARDENING AND LANDSCAPING

Homeowners who landscape need to know the kinds of soil on their property and the trees and ornamental plants best suited to those soils.

The best soils for gardening have good internal drainage, a deep root zone, and optimum fertility. They hold enough water for plant use during prolonged dry periods, and they are permeable to water, air, and roots. Incorporating organic matter into the surface layer increases the available water capacity and improves tilth. Applying mulch helps to retain moisture and prevent evaporation. The degree of acidity of the soil should be considered in selecting plants.

Roses, most annual flowers, most vegetables, and most grasses are suited to soils that are neutral or slightly acid. Flowers, such as dahlia, gladiolus, petunia, Shasta daisy, and zinnia grow best on neutral soils. Azaleas, camellias, and similar plants need acid soils. Annuals, such as alyssum, burning-bush, calendula, candytuft, celosia, dianthus, dustymiller, marigold, nasturtium, petunia, phlox, portulaca, verbena, and vinca tolerate soils that are not fertilized and are low in organic matter.

Many soils in Fulton County are well suited to the trees and ornamental plants commonly used in gardening and landscaping. Particularly well suited to yard and garden plants are the undulating and rolling Appling, Cecil, Davidson, Grover, Hiwassee, Lloyd, Lockhart, Madison, Seneca, Starr, and Wickham soils. For soils where the water table is seasonally high, such as in Helena and Worsham, or in soils that have low available water capacity, such as Buncombe and Molena, only specified plants should be selected for planting. For information concerning these specific plants, or the suitability of plants not mentioned earlier, consult a local nurseryman or the county extension agent.

SOIL PROPERTIES

Extensive data about soil properties are summarized in this section. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists identified important soil properties. They noted the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they noted the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They recorded the depth of plant roots and determined the pH or reaction of the soil.

Samples of soil material were analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in Fulton County, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in Fulton County. They also present data about pertinent soil and water features, engineering test data, and data obtained from physical and chemical laboratory analyses of soils.

ENGINEERING INDEX PROPERTIES

Table H gives estimates of engineering properties and classifications for the major horizons of each soil in Fulton County.

Most soils have, within the upper 5 feet, horizons of contrasting properties. Table H gives information for each of these contrasting horizons in a typical profile. Depth to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "The Soils of Fulton County" in the 1958 published report.

Texture is described in table H in the standard terms used by the U. S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "stony sandy loam." Other texture terms are defined in the GLOSSARY.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic matter content. Soils are grouped into 15 classes; eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the border line between two classes have a dual classification symbol, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse-grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated classification, without group index numbers, is given in table H. Also in table H the percentages, by weight, or rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (USA Standard Series) is estimated for each major horizon. The values are based on tests of soils and on field estimates from many borings.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index are estimated on the basis of test data and on observations of many soil borings.

TABLE 8.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number-				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Aa, Ab---------- Altavista	0-12	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4	0	95-100	90-100	65-99	35-60	<23	NP-7
	12-48	Clay loam, sandy clay loam, loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-7	0	95-100	95-100	60-99	45-75	20-45	5-28
	48-60	Variable----------	---	---	0	---	---	---	---		---
Ac---------- Altavista	0-12	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	95-100	90-100	70-100	45-80	<25	NP-7
	12-48	Sandy clay loam, clay loam, loam.	CL-ML, CL, SC, SM-SC	A-2, A-4, A-6, A-7-6	0	95-100	90-100	75-100	30-70	20-41	5-15
	48-60	Variable----------	---	---	-	---	---	---	---	---	---
Af, Ag, Ah, Ak, Al, Am -------- Appling	0-12	Sandy loam--------	SM, SM-SC	A-2	0-5	86-100	80-100	55-75	15-35	<27	NP-5
	12-53	Sandy clay, clay loam, clay.	MH, ML	A-7	0-5	95-100	95-100	70-92	51-80	41-70	15-30
	53-60	Variable	---	---	-	---	---	---	---	---	---
An---------- Appling	0-9	Sandy loam ----	SM, SM-SC	A-4, A-2-4	0	95-100	90-100	60-99	23-50	<30	NP-6
	9-44	Sandy clay, clay loam, clay.	SC, ML, CL, SM	A-6, A-7	0	95-100	95-100	65-97	45-71	30-58	10-25
	44-60	Variable----------	---	---	-	---	---	---	---		
Ad, Ae---------- Appling	0-5	Sandy clay loam	CL, SC, CL-ML, SM-SC	A-6, A-4	0-5	95-100	90-100	70-95	40-70	20-40	6-20
	5-43	Sandy clay, clay loam, clay.	MH, ML	A-7	0-5	95-100	95-100	70-92	51-80	41-70	15-30
	43-60	Variable	---	---	---	---	---	---	---	---	---
Ao---------- Augusta	0-12	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4	0	95-100	90-100	65-99	35-60	<23	NP-7
	12-36	Clay loam, sandy clay loam, loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-7	0	95-100	95-100	60-99	45-75	20-45	5-20
	36-60	Variable----------	---	---	0	---	---	---			
Ba---------- Buncombe	0-6	Loamy sand--------	SM, SP-SM	A-2, A-3	0	98-100	98-100	90-97	7-32	---	NP
	6-60	Loamy sand, sand	SM, SP-SM	A-2, A-3	0	98-100	98-100	98-100	7-32	---	NP
Cd, Ce, Cf, Cg, Ch, Ck, Cl, Cm-- Cecil	0-11	Sandy loam--------	SM, SM-SC	A-2, A-4	0	84-100	80-100	67-90	26-42	<30	NP-6
	11-50	Clay ----------	MH, ML	A-7, A-5	0	97-100	92-100	72-99	55-95	41-80	9-37
	50-60	Variable----------	---	---	---	---	---	---	---	---	---
Ca, Cb, Cc-------- Cecil	0-5	Clay loam---------	SM, SC, CL, ML	A-4, A-6	0	74-100	72-100	68-95	38-81	21-35	3-15
	5-40	Clay----------	MH, ML	A-7, A-5	0	97-100	92-100	72-99	55-95	41-80	9-37
	40-60	Variable----------	---	---	---	---					---
Co---------- Chewacla	0-12	Silt loam---------	ML, CL, CL-ML	A-4, A-6, A-7	0	98-100	95-100	70-100	55-90	25-49	4-20
	12-34	Silt loam, silty clay loam, clay loam.	ML, CL	A-4, A-6, A-7	0	96-100	95-100	80-100	51-98	30-49	4-22
	34-60	Variable----------	---	---	---	---	---	---	---	---	---
Cn---------- Chewacla	0-12	Fine sandy loam	SM, SM-SC	A-2, A-4	0	98-100	95-100	60-90	30-50	<35	NP-7
	12-34	Silt loam, silty clay loam, clay loam.	ML, CL	A-4, A-6, A-7	0	96-100	95-100	80-100	51-98	30-49	4-22
	34-60	Variable----------	---	---	---	---	---	---	---	---	---
Cp---------- Congaree	0-13	Fine sandy loam	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-100	20-50	<30	NP-7
	13-45	Silty clay loam, fine sandy loam, loam.	SC, ML, CL, SM	A-4, A-6, A-7	0	95-100	95-100	70-100	40-90	25-50	3-22
	45-60	Variable----------	---	---	---	---	---	---	---	---	---

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag ments > 3 inches	Percentage passing sieve number				Liquid limit	Plas ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Cr---------- Congaree	0-13	Silt loam--------	CL-ML, ML, CL	A-4	0	95-100	95-100	70-100	51-90	20-35	3-10
	13-45	Silty clay loam, fine sandy loam, loam.	SC, ML, CL, SM	A-4, A-6, A-7	0	95-100	95-100	70-100	40-90	25-50	3-22
	45-60	Variable-----	---	---	---	---	---	---	---	---	---
Da, Db, Dc -------- Davidson	0-7	Clay loam--------	CL, SC, CL-ML, SM-SC	A-6, A-4	0	94-100	84-100	75-95	40-70	25-40	5-18
	7-47	Clay	CL, CH, ML, MH	A-7, A-6	0	96-100	95-100	85-100	65-85	35-65	15-35
	47-70	Clay, clay loam, sandy clay loam.	CL, ML	A-4, A-6, A-7	0	95-100	90-100	75-100	50-80	20-50	7-25
Ga, Gb--------- Grover	0-6	Fine sandy loam	SM, SM-SC, SC	A-4	0-5	95-100	90-100	50-75	25-49	<30	NP-10
	6-38	Sandy clay loam, clay loam.	SM, ML, MH	A-6, A-7	0-5	95-100	90-100	70-85	40-70	38-65	12-30
	38-60	Sandy loam, loam, sandy clay loam.	SM, SM-SC	A-4	0-5	90-100	85-100	65-95	25-49	<30	NP-7
Gc---------- Gullied land	0-40	Clay----------	MH, ML	A-7, A-5	0	97-100	92-100	72-99	55-95	41-80	9-37
	40-60	Variable---------	---	---	---	---	---	---	---	---	---
Ha---------- Helena	0-6	Sandy loam-------	SM, SM-SC, SC	A-2, A-4	0-5	95-100	90-100	51-86	27-46	<30	NP-9
	6-32	Clay loam, sandy clay, clay.	CH	A-7	0-5	95-100	95-100	73-93	56-80	50-85	20-50
	32-60	Variable---------	---	---	---	---	---	---	---	---	---
Hb, Hc---------- Hiwassee	0-7	Sandy loam-------	SM, SM-SC	A-4, A-2	0-2	95-100	90-100	70-95	30-50	<35	NP-7
	7-52	Clay, silty clay, clay loam.	CL, ML, MH	A-7-5, A-7-6, A-6	0-2	95-100	95-100	80-100	51-95	40-80	12-36
	52-60	Sandy loam, loam, sandy clay loam.	SM, ML, SM-SC, CL-ML	A-4, A-5, A-6, A-7	0-5	93-100	90-98	60-90	36-60	20-49	4-20
Hd*: Hiwassee---------	0-6	Sandy loam-------	SM, SM-SC	A-4, A-2	0-2	95-100	90-100	70-95	30-50	<35	NP-7
	6-41	Clay, silty clay, clay loam.	CL, ML, MH	A-7-5, A-7-6, A-6	0-2	95-100	95-100	80-100	51-95	40-80	12-36
	41-60	Sandy loam, loam, sandy clay loam.	SM, ML, SM-SC, CL-ML	A-4, A-5, A-6, A-7	0-5	93-100	90-98	60-90	36-60	20-49	4-20
Louisa----------	0-4	Fine sandy loam	SM, ML	A-2, A-4	0	85-100	75-95	50-80	20-70	---	NP
	4-19	Gravelly loam, gravelly sandy loam.	SM	A-2, A-4	0-5	80-95	60-80	50-70	20-45	---	NP
	19-60	Variable---------	---	---	---	---	---	---	---	---	---
Ir---------- Iredell	0-5	Stony clay loam---	CL, CH, MH	A-6, A-7	10-30	80-100	80-95	75-95	50-85	30-60	11-32
	5-12	Clay loam, clay, sandy clay loam.	CL, CH, MH	A-6, A-7	0-10	80-100	80-95	75-95	50-80	30-60	11-32
	12-40	Variable----------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE H.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Le, Lf, Lg, Lh, Lk, Lm Lloyd	0-8	Sandy loam	SM, SM-SC	A-2, A-1-B	0-2	85-100	80-100	42-80	16-35	<28	NP-7
	8-40	Sandy clay, clay loam, clay.	ML, MH, CL	A-6, A-7	0-1	80-100	80-100	60-95	51-75	38-65	11-30
	40-60	Sandy loam, fine sandy loam, loam.	SM, SM-SC	A-4, A-2-4	0-2	80-100	70-100	60-80	30-50	<28	NP-6
La, Lb, Lc Lloyd	0-5	Clay loam	SM-SC, SC	A-4, A-6	0-1	95-100	90-100	65-85	36-50	20-40	4-17
	5-34	Sandy clay, clay loam, clay.	ML, MH, CL	A-6, A-7	0-1	80-100	80-100	60-95	51-75	38-65	11-30
	34-60	Sandy loam, fine sandy loam, loam.	SM, SM-SC	A-4, A-2-4	0-2	80-100	70-100	60-80	30-50	<28	NP-6
Ld Lloyd	0-6	Fine sandy loam	SM	A-2	0-2	75-90	65-85	35-75	15-30	<30	NP-3
	6-20	Sandy clay, clay loam, clay.	ML, MH, CL	A-6, A-7	0-1	80-100	80-100	60-95	51-75	38-65	11-30
	20-60	Sandy loam, fine sandy loam, loam.	SM, SM-SC	A-4, A-1-4	0-2	80-100	70-100	60-80	30-50	<28	NP-6
Lr*, Ls*, Lt*, Lu*, Lv*, Lw* Cecil	0-7	Sandy loam	SM, SM-SC	A-2, A-4	0	80-100	80-100	67-90	26-42	<30	NP-6
	7-50	Sandy clay loam, clay loam.	SM, SC, ML, CL	A-4, A-6	0	78-100	72-100	68-95	38-81	21-35	3-15
	50-60	Variable	---	---	---	---	---	---	---	---	---
La*, Lo*, Lp* Cecil	0-5	Clay loam	SM, SC, CL, ML	A-4, A-6	0	78-100	72-100	68-95	38-81	21-35	3-15
	5-42	Sandy clay loam, clay loam.	SM, SC, ML, CL	A-4, A-6	0	78-100	72-100	68-95	38-81	21-35	3-15
	42-60	Variable	---	---	---	---	---	---	---	---	---
LxB, LxC, LxA, Lz Louisa	0-5	Fine sandy loam	SM, SM-SC	A-2, A-4	0-2	80-100	75-95	50-80	30-40	<30	NP-7
	5-24	Fine sandy loam, sandy loam, loam.	SM, SM-SC	A-2, A-4	0-2	80-100	75-100	50-80	30-50	<30	NP-7
	24-60	Variable	---	---	---	---	---	---	---	---	---
LyB, LyA, Ly Louisburg	0-5	Sandy loam	SM, SM-SC	A-2	0-15	80-100	75-95	50-80	25-35	<30	NP-6
	5-15	Sandy loam	SM, SM-SC	A-2, A-4	0-15	85-100	75-98	53-78	25-40	<40	NP-7
	15-60	Variable	---	---	---	---	---	---	---	---	---
Ma* Made land											
Md, Me, Mf, Mg, Mh, Mk Madison	0-7	Fine sandy loam	SM	A-2, A-4	0-3	85-100	80-100	60-90	26-49	<35	NP-8
	7-36	Clay, clay loam	MH, ML	A-7	0-3	90-100	85-100	75-97	57-85	43-82	12-43
	36-60	Variable	---	---	---	---	---	---	---	---	---
Ml, Mm Madison	0-8	Gravelly sandy loam.	SM	A-2, A-4	3-10	75-95	60-85	50-70	30-49	<35	NP-7
	8-36	Clay, clay loam	MH, ML	A-7	0-3	90-100	85-100	75-97	57-85	43-82	12-43
	36-60	Variable	---	---	---	---	---	---	---	---	---
Mb, Mc Madison	0-5	Clay loam	CL	A-4, A-6	0-3	90-100	85-100	70-95	50-80	20-40	7-20
	5-30	Clay, clay loam	MH, ML	A-7	0-3	90-100	85-100	75-97	57-85	43-82	12-43
	30-60	Variable	---	---	---	---	---	---	---	---	---
Mo*, Mp*, Mr* Madison	0-9	Gravelly sandy loam.	SM	A-2, A-4	3-10	75-95	60-85	50-70	30-49	<35	NP-7
	9-35	Clay, clay loam	MH, ML	A-7	0-3	90-100	85-100	75-97	57-85	43-82	12-43
	35-60	Variable	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticit index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Mo*, Mp*, Mr*:											
Grover	0-10	Gravelly sandy loam	SM	A-2, A-4	3-10	75-95	60-85	50-70	30-40	<35	NP-7
	10-38	Sandy clay loam, clay loam.	SM, ML, MH	A-6, A-7	0-5	95-100	90-100	70-85	40-70	38-65	12-30
	38-60	Sandy loam, loam, sandy clay loam.	SM, SM-SC	A-4	0-5	90-100	85-100	65-95	25-49	<30	NP-7
Louisa	0-6	Gravelly sandy loam.	SM	A-2	0-10	80-95	60-75	50-70	20-35	---	NP
	6-24	Fine sandy loam, sandy loam, loam.	SM, SM-SC	A-2, A-4	0-2	80-100	75-100	50-80	30-50	<30	NP-7
	24-60	Variable	---	---	---	---	---	---	---	---	---
Mp*:											
Madison	0-9	Gravelly clay loam	SM, ML, MH	A-6, A-7	3-10	75-95	65-85	55-75	40-70	38-65	17-30
	9-35	Clay, clay loam	MH, ML	A-7	0-3	90-100	85-100	75-97	57-85	43-82	12-43
	35-60	Variable	---	---					---	-	---
Grover	0-10	Gravelly clay loam	SM, ML, MH	A-6, A-7	3-10	75-95	65-85	55-75	40-70	38-65	17-30
	10-38	Sandy clay loam, clay loam.	SM, ML, MH	A-6, A-7	0-5	95-100	90-100	70-85	40-70	38-65	12-30
	38-60	Sandy loam, loam, sandy clay loam.	SM, SM-SC	A-4	0-5	90-100	85-100	65-95	25-49	<30	NP-7
Louisa	0-6	Gravelly sandy loam.	SM	A-2	0-10	80-95	60-75	50-70	20-35	---	NP
	6-24	Fine sandy loam, sandy loam, loam.	SM, SM-SC	A-2, A-4	0-2	80-100	75-100	50-80	30-50	<30	NP-7
	24-60	Variable	---	---	---	---	---	---	---	---	---
Mt	0-6	Gravelly sandy loam	SM, SM-SC	A-2, A-4, A-1-B	0-10	70-80	60-75	45-75	20-49	<20	NP-7
Mecklenburg	6-41	Clay	CH, MH	A-7	0-5	90-100	85-100	80-100	75-95	51-75	24-45
	41-60	Variable	---	---					---	---	---
Ms	0-4	Gravelly clay loam	SM, ML, MH	A-6, A-7	0-10	75-95	65-85	55-75	40-70	38-65	12-30
Mecklenburg	4-34	Clay	CH, MH	A-7	0-5	90-100	85-100	80-100	75-95	51-75	24-45
	34-60	Variable	---	---	---	---	---	---	---	---	---
Mu	0-10	Sandy loam	SM	A-2, A-4	0	95-100	95-100	85-100	25-50	<30	NP-4
Mixed alluvium	10-60	Sandy loam, loam	SM, ML	A-2, A-4	0	95-100	90-100	60-100	30-55	<30	NP-4
Mv	0-9	Sandy loam	SM	A-2, A-4	0	90-100	75-100	60-80	20-50	---	NP
Mixed alluvium	9-40	Sandy loam, fine sandy loam, loam.	SM, SC, SM-SC	A-2, A-4	0	90-100	75-100	60-85	25-50	<30	NP-10
	40-60	Loamy sand, sand, sandy loam.	SM, SP-SM	A-2, A-3	0	80-100	35-95	25-80	5-35		NP
Mw	0-8	Fine sandy loam	SM, SC, SM-SC	A-2, A-4	0	100	95-100	60-90	30-50	<35	NP-10
Mixed alluvium	8-40	Loam, sandy clay loam, clay loam.	ML, CL, CL-ML	A-6, A-7, A-4	0	100	99-100	85-100	51-85	25-45	7-20
	40-50	Variable	---	---	---	---	---	---	---	---	---
My, Mx	0-4	Loamy sand	SM, SP-SM	A-2, A-3	0	100	98-100	55-95	5-15	---	NP
Nolesa	4-60	Loamy fine sand, loamy sand.	SM, SP-SM	A-2, A-3	0	100	98-100	55-95	7-25	---	NP
Ra	0-10	Sand	SM, SP-SM	A-2, A-3	0	98-100	98-100	90-97	7-32	---	NP
Riverwash	10-60	Loamy sand, sand	SM, SP-SM	A-2, A-3	0	98-100	98-100	98-100	7-32	---	NP
Sb	0-30	Fine sandy loam	SM, ML	A-2, A-4	0	98-100	95-100	85-100	20-60	<30	NP-4
Seneca	30-60	Sandy loam, loam	SM, ML	A-2, A-4	0	95-100	90-100	60-100	30-55	<30	NP-4

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Sa---------- Seneca	0-30 30-60	Fine sandy loam Sandy loam, loam	SM, ML SM, ML	A-2, A-4 A-2, A-4	0 0	98-100 95-100	95-100 90-100	65-100 60-100	20-60 30-55	<30 <30	NP-4 NP-4
Sd, Sc---------- Starr	0-35 35-60	Loam---------- Sandy loam, loam	SM, ML SM, ML	A-2, A-4 A-2, A-4	0 0	98-100 95-100	95-100 90-100	65 100 60 100	20 60 30 55	<30 <30	NP-4 NP 4
Se---------- Stony land rolling	0-9 9-13 13-36 36-72	Bouldery sandy loam. Stony sandy clay loam, stony clay loam, bouldery sandy clay loam. Bouldery clay, bouldery clay loam, bouldery sandy clay. Variable----------	SM SM, SC, SM-SC SC, CL ---	A-2 A-2, A-4 A-4, A-6, A-7 ---	10-22 10 30 10-35 ---	80-98 75 95 75-95 ---	66-85 60 90 60-90 ---	50-75 55 80 60 80 ---	15-30 25-45 45 75 ---	<30 20-35 25 45 -	NP-4 4-10 8 25 --
Sf---------- Stony land hilly	0-9 9-13 13-36 36 72	Bouldery sandy loam. Stony sandy clay loam, stony clay loam, bouldery sandy clay loam. Bouldery clay, bouldery clay loam, bouldery sandy clay. Variable ----------	SM SM, SC, SM-SC SC, CL ---	A-2 A-2, A-4 A-4, A-6, A 7 ---	10 22 10-30 10-35 ---	80 98 75 95 75-95 ---	66-85 60-90 60-90 ---	50-75 55-80 60 80 ---	15-30 25-45 45 75 ---	<30 20-35 25-45 ---	NP-4 4-10 8-25 ---
Sg---------- Stony land steep	0-9 9 13 13-36 36-72	Bouldery sandy loam. Stony sandy clay loam, stony clay loam, bouldery sandy clay loam. Bouldery clay, bouldery clay loam, bouldery sandy clay. Variable ----------	SM SM, SC, SM SC SC, CL ---	A 2 A 2, A-4 A-4, A-6, A-7 ---	10-22 10-30 10-35 ---	80-98 75-95 75-95 ---	66-85 60-90 60-90 ---	50-75 55-80 60 80 ---	15-30 25-45 45 75 ---	<30 20-35 25-45 ---	NP-4 4-10 8-25 ---
Ua*. Unclassified city land											
Wb---------- Wehadkee	0-36 36-60	Silt loam--------- Loam, sandy clay loam, clay loam.	CL, ML, ML ML, CL, CL-ML	A 6, A-7 A-6, A-7, A-4	0 0	100 100	98-100 99-100	85-100 85-100	51-98 51-85	30-58 25-45	10-24 7-20
Wa---------- Wehadkee	0-36 36-60	Fine sandy loam Loam, sandy clay loam, clay loam.	SM, SC, SM-SC ML, CL, CL-ML	A-2, A-4 A-6, A-7, A-4	0 0	100 100	95-100 99-100	60-90 85-100	30-50 51-85	<35 25-45	NP-10 7-20
Wc, Wd---------- Wickham	0-12 12-45 45-60	Fine sandy loam Sandy clay loam, clay loam, loam. Variable----------	SM, SM-SC, ML, CL-ML CL-ML, CL, SC, SM-SC ---	A-4 A-2, A-4, A-6, A-7-6 ---	0 0 ---	95-100 95-100 ---	90-100 90-100 ---	70-100 75-100 ---	45-80 30-70 ---	<25 20-41 ---	NP-7 5-15 ---
We, Wf, Wg------- Worsham	0-12 12-42 42-60	Sandy loam-------- Sandy clay loam, sandy clay, clay. Sandy loam, sandy clay loam, clay loam.	SM, SC, ML, CL SC, CH, CL SC, CL	A-2, A-4 A-2, A-7 A-2, A-4, A-6, A-7	0-5 0-5 0-10	90-100 90-100 90-95	85-100 85-100 80-95	50-85 70-100 50-90	25-55 30-95 30-70	<30 42-66 20 50	NP-9 22-40 8-30

* See description of the map unit for composition and behavior characteristics of the map unit.

PHYSICAL AND CHEMICAL PROPERTIES

Table J shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to absorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field, particularly soil structure, porosity, and gradation or texture, that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, bulk density, and soil structure. Shallow rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods are made for many soils. For others the swelling is estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size

of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are low, a change of less than 3 percent; moderate, 3 to 6 percent; and high, more than 6 percent.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.37 in Fulton County. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil loss tolerance factor (T) is the maximum rate of soil erosion from rainfall that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table J, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

TABLE 3.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
Aa, Ab	0-12	10-24	1.30-1.50	2.0-6.0	0.12-0.20	4.5-6.0	Low	0.24	5	.5-3
Altavista	12-48	18-35	1.30-1.50	0.6-2.0	0.12-0.20	4.5-6.0	Low	0.24		
	48-60	---	---	---	---	---				
Ac	0-12	8-15	1.45-1.65	2.0-6.0	0.11-0.16	4.5-6.0	Low	0.24	5	.5-2
Altavista	12-48	18-25	1.30-1.40	0.6-2.0	0.12-0.17	4.5-6.0	Low	0.24		
	48-60	---	---							
Af, Ag, Ah, Ak, Al, Am	0-12	5-20	1.40-1.65	2.0-6.0	0.10-0.15	4.5-5.5	Low	0.24	4	.5-2
Appling	12-53	35-60	1.25-1.45	0.6-2.0	0.15-0.17	4.5-5.5	Low	0.20		
	53-60	---	---	---	---	---				
An	0-9	6-20	---	2.0-6.0	0.10-0.18	4.5-5.5	Low	0.24	3	<1
Appling	9-44	35-45		0.6-2.0	0.12-0.18	4.5-5.5	Moderate	0.28		
	44-60	---	---	---	---	---				
Ad, Ae	0-5	20-35	1.30-1.45	0.6-2.0	0.12-0.15	4.5-5.5	Low	0.20	4	.5-1
Appling	5-43	35-60	1.25-1.45	0.6-2.0	0.15-0.17	4.5-5.5	Low	0.20		
	43-60	---	---	---	---					
Ao	0-12	10-24	1.30-1.50	2.0-6.0	0.12-0.20	4.5-6.0	Low	0.24	5	.5-3
Augusta	12-36	18-35	1.30-1.50	0.6-2.0	0.12-0.20	4.5-6.0	Low	0.24		
	36-60	---								
Ba	0-6	3-12	1.60-1.75	>6.0	0.06-0.10	6.1-6.5	Low	0.10	5	.5-1
Buncombe	6-60	3-12	1.60-1.75	>6.0	0.03-0.07	4.5-6.0	Low	0.10		
Cd, Ce, Cf, Cg, Ch, Ck, Cl, Cm	0-11	5-20	1.00-1.50	2.0-6.0	0.12-0.14	4.5-6.0	Low	0.28	4	.5-2
Cecil	11-50	40-60	1.30-1.50	0.6-2.0	0.13-0.15	4.5-5.5	Low	0.28		
	50-60	---	---	---	---	---				
Cn, Cb, Cc	0-5	20-35	1.30-1.50	0.6-2.0	0.13-0.15	4.5-6.0	Low	0.28	4	.5-1
Cecil	5-40	40-60	1.30-1.50	0.6-2.0	0.13-0.15	4.5-5.5	Low	0.28		
	40-60	---	---	---	---	---				
Co	0-12	10-27	1.30-1.60	0.6-2.0	0.15-0.24	4.5-6.5	Low	0.28	5	1-4
Chewacla	12-38	18-35	1.30-1.50	0.6-2.0	0.15-0.24	4.5-6.5	Low	0.32		
	38-60	---	---	---	---	---				
Cn	0-12	5-20	1.30-1.60	0.6-2.0	0.10-0.15	4.5-6.5	Low	0.24	5	1-4
Chewacla	12-38	18-35	1.30-1.50	0.6-2.0	0.15-0.24	4.5-6.5	Low	0.32		
	38-60	---	---	---	---	---				
Cp	0-13	5-15	1.30-1.60	0.6-6.0	0.12-0.18	4.5-7.3	Low	0.20	5	<2
Congaree	13-45	18-35	1.20-1.50	0.6-2.0	0.12-0.20	4.5-7.3	Low	0.37		
	45-60	---	---	---	---	---				
Cr	0-13	10-25	1.20-1.40	0.6-2.0	0.12-0.20	4.5-7.3	Low	0.37	5	<2
Congaree	13-45	18-35	1.20-1.50	0.6-2.0	0.12-0.20	4.5-7.3	Low	0.37		
	45-60	---	---	---	---	---				
Da, Db, Dc	0-7	---	---	0.6-2.0	0.14-0.18	4.5-6.5	Low	0.28	5	---
Davidson	7-47	---	---	0.6-2.0	0.12-0.16	4.5-6.0	Low	0.24		
	47-70	---	---	0.6-2.0	0.12-0.18	4.5-6.0	Low	0.28		
Ga, Gb	0-6	4-18	1.45-1.65	2.0-6.0	0.07-0.10	4.5-6.5	Low	0.24	3	.5-2
Grover	6-38	18-35	1.25-1.40	0.6-2.0	0.12-0.14	4.5-5.5	Low	0.32		
	38-60	4-25	1.60-1.75	0.6-2.0	0.06-0.10	4.5-5.5	Low	0.32		

TABLE J.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
Gc----------	0-40	40-60	1.30-1.50	0.6-2.0	0.13-0.15	4.5-5.5	Low----------	0.28	---	---
Gullied land	40-60	---	---	---	---	---	----------	---		
Ha----------	0-6	5-20	1.58-1.62	2.0-6.0	0.10-0.12	4.5-6.0	Low----------	0.15	3	.5-2
Helena	6-32	35-60	1.44-1.55	0.06-0.2	0.13-0.15	4.5-5.5	High---------	0.28		
	32-60	---	---	---	---	---	----------	---		
Hb, Hc----------	0-7	7-20	1.45-1.65	0.6-2.0	0.10-0.14	4.5-6.5	Low----------	0.28	5	.5-2
Hiwassee	7-52	35-60	1.30-1.45	0.6-2.0	0.12-0.15	4.5-6.5	Low----------	0.28		
	52-60	7-35	1.45-1.65	0.6-2.0	0.10-0.14	4.5-6.5	Low----------	0.28		
Hd*:										
Hiwassee--------	0-6	7-20	1.45-1.65	0.6-2.0	0.10-0.14	4.5-6.5	Low----------	0.28	5	.5-2
	6-41	35-60	1.30-1.45	0.6-2.0	0.12-0.15	4.5-6.5	Low----------	0.28		
	41-60	7-35	1.45-1.65	0.6-2.0	0.10-0.14	4.5-6.5	Low----------	0.28		
Louisa----------	0-4	10-25	1.25-1.55	2.0-6.0	0.12-0.16	4.5-6.0	Low----------	0.28	2	.5-2
	4-19	12-27	1.35-1.55	2.0-6.0	0.10-0.15	4.5-6.0	Low----------	0.24		
	19-60	---	---	---	---	---	----------	---		
Ir----------	0-5	20-40	1.40-1.60	0.2-0.6	0.15-0.20	5.6-7.8	Moderate-----	0.32	2	<1
Iredell	5-12	20-40	1.40-1.60	0.2-0.6	0.15-0.20	6.1-7.8	Moderate-----	0.32		
	12-40									
Le, lf, Lg, Lh,										
Lk, Ln----------	0-8	8-20	1.00-1.50	2.0-6.0	0.08-0.12	4.5-6.5	Low----------	0.20	3	.5-2
Lloyd	8-40	35-65	1.30-1.50	0.6-2.0	0.12-0.15	4.5-6.0	Low----------	0.28		
	40-60	10-25	1.20-1.50	0.6-2.0	0.08-0.15	4.5-6.0	Low----------	0.28		
La, Lb, Lc--------	0-5	20-35	1.30-1.50	0.6-2.0	0.10-0.14	4.5-6.5	Low----------	0.24	2	.5-1
Lloyd	5-34	35-65	1.30-1.50	0.6-2.0	0.12-0.15	4.5-6.0	Low----------	0.28		
	34-60	10-25	1.20-1.50	0.6-2.0	0.08-0.15	4.5-6.0	Low----------	0.28		
Ld----------	0-6	8-20	1.00-1.50	2.0-6.0	0.06-0.10	4.5-6.5	Low----------	0.15	4	.5-2
Lloyd	6-20	35-65	1.30-1.50	0.6-2.0	0.12-0.15	4.5-6.0	Low----------	0.28		
	20-60	10-25	1.20-1.50	0.6-2.0	0.08-0.15	4.5-6.0	Low----------	0.28		
Lr*, Ls*, Lt*,										
Lu*, Lv*, Lw*----	0-7	5-20	1.00-1.50	2.0-6.0	0.12-0.14	4.5-6.0	Low----------	0.28	4	.5-2
Cecil	7-50	20-35	1.30-1.50	0.6-2.0	0.13-0.15	4.5-6.0	Low----------	0.28		
	50-60	---	---	---	---	---	----------	---		
Ln*, Lo*, Lp*----	0-5	20-35	1.30-1.50	0.6-2.0	0.13-0.15	4.5-6.0	Low----------	0.28	4	.5-1
Cecil	5-42	20-35	1.30-1.50	0.6-2.0	0.13-0.15	4.5-6.0	Low----------	0.28		
	42-60	---	---	---	---	---	----------	---		
LrB, LrC, LrE,										
Lr----------	0-5	10-15	---	2.0-6.0	0.12-0.16	4.5-6.0	Low----------	0.28	2	2-5
Louisa	5-24	5-17	---	2.0-6.0	0.10-0.15	4.5-6.0	Low----------	0.28		
	24-60	---	---	---	---	---	----------	---		
LyB, LyA, Ly-----	0-5	5-15	1.25-1.45	6.0-20	0.09-0.12	4.5-6.0	Very low-----	0.24	2	.5-2
Louisburg	5-15	7-18	1.30-1.50	6.0-20	0.10-0.12	4.5-6.0	Very low-----	0.24		
	15-60	---	---	---	---	---	----------	---		
Ma*.										
Made land										
Md, Me, Mf, Mg,										
Mh, Mk----------	0-7	5-15	1.45-1.65	2.0-6.0	0.11-0.15	4.5-6.0	Low----------	0.24	4	.5-2
Madison	7-36	30-50	1.20-1.40	0.6-2.0	0.13-0.18	4.5-5.5	Low----------	0.32		
	36-60	-		---			----------	---		
Ml, Mm----------	0-8	5-15	1.45-1.65	>6.0	0.08-0.13	4.5-6.0	Low----------	0.15	4	.5-2
Madison	8-36	30-50	1.20-1.40	0.6-2.0	0.13-0.18	4.5-5.5	Low----------	0.32		
	36-60	---	---	---	---	---	----------	---		

See footnote at end of table.

TABLE 3.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
Mb, Mc	0-5	25-35	1.30-1.40	0.6-2.0	0.12-0.16	4.5-6.0	Low	0.28	4	.5-2
Madison	5-30	30-50	1.20-1.40	0.6-2.0	0.13-0.18	4.5-5.5	Low	0.32		
	30-60	---	---	---	---	---	---	---		
Mo*, Sp*, Sr*:										
Madison	0-9	5-15	1.45-1.65	>6.0	0.08-0.13	4.5-6.0	Low	0.15	4	.5-2
	9-35	30-50	1.20-1.40	0.6-2.0	0.13-0.18	4.5-5.5	Low	0.32		
	35-60	---	---	---	---	---	---	---		
Grover	0-10	5-15	1.45-1.65	>6.0	0.05-0.13	4.5-6.0	Low	0.15	4	.5-2
	10-38	18-35	1.25-1.40	0.6-2.0	0.12-0.14	4.5-5.5	Low	0.32		
	38-60	4-25	1.60-1.75	0.6-2.0	0.06-0.10	4.5-5.5	Low	0.32		
Louisa	0-6	10-15	---	2.0-6.0	0.10-0.14	4.5-6.0	Low	0.17	2	2-5
	6-24	5-17	---	2.0-6.0	0.10-0.15	4.5-6.0	Low	0.28		
	24-60	---	---	---	---	---	---	---		
Mn*:										
Madison	0-9	25-35	1.30-1.40	0.6-2.0	0.12-0.16	4.5-6.0	Low	0.28	3	5-2
	9-35	30-50	1.20-1.40	0.6-2.0	0.13-0.18	4.5-5.5	Low	0.32		
	35-60	---	---	---	---	---	---	---		
Grover	0-10	25-35	1.30-1.40	0.6-2.0	0.12-0.16	4.5-6.0	Low	0.28	3	.5-2
	10-38	18-35	1.25-1.40	0.6-2.0	0.12-0.14	4.5-5.5	Low	0.32		
	38-60	4-25	1.60-1.75	0.6-2.0	0.06-0.10	4.5-5.5	Low	0.32		
Louisa	0-6	10-15	---	2.0-6.0	0.10-0.14	4.5-6.0	Low	0.17	2	2-5
	6-24	5-17		2.0-6.0	0.10-0.15	4.5-6.0	Low	0.28		
	24-60	---	---							
Mt	0-6	5-20	1.30-1.50	2.0-6.0	0.10-0.14	5.1-6.5	Low	0.24	2	5-2
Mecklenburg	6-41	40-60	1.40-1.60	0.06-0.2	0.12-0.14	5.6-7.3	Moderate	0.32		
	41-60	---	---	---	---	---	---	---		
Ms	0-4	25-35	1.30-1.40	0.6-2.0	0.12-0.16	4.5-6.0	Low	0.28	3	5-2
Mecklenburg	4-34	40-60	1.40-1.60	0.06-0.2	0.12-0.14	5.6-7.3	Moderate	0.32		
	34-60	---	---	---	---	---	---	---		
Mu	0-10	2-15	1.40-1.55	2.0-6.0	0.09-0.12	5.1-6.5	Low	0.10	4	1-2
Mixed alluvium	10-60	2-19	1.40-1.50	2.0-6.0	0.09-0.12	5.1-6.5	Low	0.10		
My	0-9	5-19	---	6.0-20	0.06-0.10	5.1-6.5	Low	0.24	5	1-2
Mixed alluvium	9-40	8-18		2.0-6.0	0.09-0.12	5.1-6.5	Low	0.24		
	40-60	2-16		6.0-20	0.06-0.09	5.1-6.5	Low	0.15		
Mw	0-8	5-20	1.35-1.60	2.0-6.0	0.10-0.15	4.5-6.5	Low	0.24	5	2-5
Mixed alluvium	8-40	18-35	1.30-1.50	0.6-2.0	0.16-0.20	4.5-6.5	Low	0.32		
	40-50	---	---	---	---	---	---	---		
My, Mx	0-4	2-7	1.35-1.55	6.0-20	0.05-0.07	4.5-6.5	Very low	0.10	5	.5-2
Molena	4-60	5-10	1.45-1.60	6.0-20	0.06-0.09	4.5-6.0	Very low	0.17		
Ra	0-10	3-12	1.60-1.75	>6.0	0.06-0.10	6.1-6.5	Low	0.10	5	.5-1
Riverwash	10-60	3-12	1.60-1.75	>6.0	0.03-0.07	4.5-6.0	Low	0.10		
Sb, Sa	0-30	3-17	1.35-1.45	2.0-6.0	0.09-0.12	5.1-6.5	Low	0.24	5	1-2
Seneca	30-60	2-19	1.40-1.50	2.0-6.0	0.09-0.12	5.1-6.5	Low	0.10		
Sd, Sc	0-35	3-17	1.35-1.45	2.0-6.0	0.09-0.12	5.1-6.5	Low	0.24	5	1-2
Starr	35-60	2-19	1.40-1.50	2.0-6.0	0.09-0.12	5.1-6.5	Low	0.10		
Se	0-9	---	---	2.0-6.0	0.05-0.12	4.5-5.5	Low	0.15	3	
Stony land	9-13	---	---	0.6-2.0	0.08-0.14	4.5-5.5	Low	0.32		
rolling	13-36	---	---	0.6-2.0	0.08-0.12	4.5-5.5	Low	0.32		
	36-72	---	---							

See footnote at end of table.

TABLE J. PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cm³	In/hr	In/in	pH				Pct
Sf---------- Stony land hilly	0-9 9-13 13-36 36-72	--- --- 	--- --- ---	2.0-6.0 0.6-2.0 0.6-2.0 ---	0.06-0.12 0.08-0.14 0.08-0.12 ---	4.5-5.5 4.5-5.5 4.5-5.5 ---	Low---------- Low---------- Low---------- ----------	0.15 0.32 0.32 ----	3	---
Sg---------- Stony land steep	0-9 9-13 13-36 36-72	--- --- --- ---	 --- --- ---	2.0-6.0 0.6-2.0 0.6-2.0 ---	0.06-0.12 0.08-0.14 0.08-0.12 ---	4.5-5.5 4.5-5.5 4.5-5.5 ---	Low---------- Low---------- Low---------- ----------	0.15 0.32 0.32 ----	3	
Ua*. Unclassified city land										
Wb---------- Wehadkee	0-36 36-60	15-40 18-35	1.35-1.50 1.30-1.50	0.6-2.0 0.6-2.0	0.15-0.24 0.16-0.20	4.5-6.5 4.5-6.5	Low---------- Low----------	0.32 0.32	5	2-5
Wa---------- Wehadkee	0-36 36-60	5-20 18-35	1.35-1.60 1.30-1.50	2.0-6.0 0.6-2.0	0.10-0.15 0.16-0.20	4.5-6.5 4.5-6.5	Low---------- Low----------	0.24 0.32	5	2-5
Wc, Wd---------- Wickham	0-12 12-45 45-60	8-15 18-25 ---	1.45-1.65 1.30-1.40 ---	2.0-6.0 0.6-2.0 ---	0.11-0.16 0.12-0.17 ---	4.5-6.0 4.5-6.0 ---	Low---------- Low---------- ----------	0.24 0.24 ---	5	.5-2
We, Wf, Wg------- Worsham	0-12 12-42 42-60	10-20 30-55 10-40	1.25-1.55 1.35-1.65 1.20-1.50	2.0-6.0 0.06-0.6 0.2-0.6	0.08-0.15 0.10-0.16 0.08-0.19	4.5-5.5 4.5-5.5 4.5-5.5	Low---------- Moderate----- Moderate-----	0.28 0.28 0.28	4	1-2

* See description of the map unit for composition and behavior characteristics of the map unit.

SOIL AND WATER FEATURES

Table K contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams and by runoff from adjacent slopes. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. Frequency is expressed as none, rare, common, occasional, and frequent. None means that flooding is not probable; rare that it is unlikely but possible under unusual weather conditions; common that it is likely under normal conditions; occasional that it occurs, on the average, no more than once in 2 years; and frequent that it occurs, on the average, more than once in 2 years. Duration is expressed as very brief if less than 2 days, brief if 2 to 7 days, and long if more than 7 days. Probable dates are expressed in months; November-April, for example, means that flooding can occur during the period November through April. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding; and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land use planning and provides a valid basis for land use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone in the soil for a continuous period of more than 1 month during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table K are the depth to the seasonal high water table; the kind of water table, that is, perched or apparent; and the months of the year that the water table commonly is high.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Soft bedrock can be excavated with trenching machines, backhoes, or small rippers, but hard bedrock generally requires blasting.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil horizons is more susceptible to corrosion than an installation that is entirely within one soil horizon.

For uncoated steel, the risk of corrosion, expressed as low, moderate, or high is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract. For concrete, the risk of corrosion is also expressed as moderate or high. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

TABLE K.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
Aa, Ab Altavista	C	Rare	---	---	1.5-2.5	Apparent	Dec-Mar	>60	---	Moderate	Moderate.
Ac Altavista	B	None	---	---	>6.0	-	---	>60	---	Moderate	High.
Af, Ag, Ah, Ak, Al, Am Appling	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
An Appling	B	None	---	---	>6.0	---	---	>60	---	Moderate	High.
Ad, Ae Appling	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Ao Augusta	C	Rare	---	---	1.5-2.5	Apparent	Dec-Mar	>60	---	Moderate	Moderate.
Ba Buncombe	A	Rare	---	---	>6.0	---	---	>60	---	Low	Moderate.
Cd, Ce, Cf, Cg, Ch, Ck, Cl, Ca, Ca, Cb, Cc Cecil	B	None	---	---	>6.0	-	---	>60	---	Moderate	Moderate.
Co, Cn Chewacla	C	Frequent	Brief	Nov-Apr	0.5-1.5	Apparent	Nov-Apr	>60	---	High	Moderate.
Cp, Cr Congaree	B	Frequent	Brief	Nov-Apr	2.5-4.0	Apparent	Nov-Apr	>60		Moderate	Moderate.
Da, Db, Dc Davidson	B	None	---	---	>6.0			>60	---	High	Moderate.
Ga, Gb Grover	B	None	---	---	>6.0	---	---	>60		Moderate	Moderate.
Gc Gullied land	B	None	---	-	>6.0			>60		Moderate	Moderate.
Ha Helena	C	None	---	---	1.5-2.5	Perched	Jan-Apr	48-60	Soft	High	High.
Hb, Hc Hiwassee	B	None	---	---	>6.0	-	---	>60		Moderate	Moderate.
Hd*: Hiwassee	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Louisa	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
Ia Iredell	C	None	---	---	>6.0	---	---	<20	Soft	Moderate	Moderate.
Le, Lf, Lg, Lh, Lk, Ln, La, Lb, Lc, Ld Lloyd	B	None	---	---	>6.0	---	-	>60	---	High	High.
Lr*, Ls*, Lt*, Lu*, Lv*, Lw*, Ln*, Lo*, Lp* Cecil	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.

See footnote at end of table.

TABLE 8.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
LxB, LxC, LxA, Lx- Louisa	B	None	---	---	>6.0	--		24-50	Soft	Low	Moderate
LyB, LyA, Ly- Louisburg	B	None	---	---	>6.0	---	--	>40	Hard	Low	Moderate
Ma*. Made land											
Md, Me, Mf, Mg, Mh, Mk, Ml, Mn, Mb, Mc- Madison	B	None	-	---	>6.0	---	---	>60	---	High	Moderate
Mo*, Mp*, Mr*, Ms*:											
Madison	B	None	---	---	>6.0	---	---	>60	---	High	Moderate
Grover	B	None	---	---	>6.0	---	-	>60	---	Moderate	Moderate
Louisa	B	None		---	>6.0	--		24-50	Soft	Low	Moderate
Mt, Ms Mecklenburg	C	None	---	---	>6.0			48-60	Hard	High	Moderate
Mu Mixed alluvium	B	Frequent	Brief	Jan-Dec	2.5-5.0	Apparent	Dec-Apr	>60	-	Low	Moderate
Mv Mixed alluvium	C	Frequent	Brief	Dec-Mar	0.5-1.5	Apparent	Jan-Apr	>60	---	Low	Moderate
Mw Mixed alluvium	D	Frequent	Brief	Nov-Jun	0-2.5	Apparent	Dec-May	>60	---	High	Moderate
My, Mx Molena	A	None	---	---	>6.0	---	---	>60	---	Low	High.
Ra Riverwash	A	Rare	---	---	>6.0	---	---	>60	---	Low	Moderate
Sb, Sa Seneca	B	None		--	2.5-5.0	Apparent	Dec-Apr	>60	---	Low	Moderate
Sd, Sc Starr	B	None	---	---	2.5-5.0	Apparent	Dec-Apr	>60	---	Low	Moderate
Se Stony land rolling	B	None		---	>6.0	---	---	>60	---	High	High.
Sf Stony land hilly	B	None	--		>6.0			>60	---	High	High.
Sg Stony land steep	B	None	---	---	>6.0	---	---	>60	---	High	High.
Ua*. Unclassified city land											
Wb, Wa Wehadkee	D	Frequent	Brief	Nov-Jun	0-2.5	Apparent	Dec-May	>60	---	High	Moderate
Wc, Wd Wickham	B	Rare	---	---	>6.0	---	---	>60		Moderate	High.
We, Wf, Wg Worsham	D	None	---	---	0-1.0	Apparent	Nov-Apr	>60	---	High	Moderate

* See description of the map unit for composition and behavior characteristics of the map unit.

GLOSSARY *

*Applies to terms used in supplement. Terms used in the soil report are defined on pages 65-67 of that publication.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Compressible. Excessive decrease in volume of soft soil under load.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Forb. Any herbaceous plant not a grass or a sedge.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artifically drained and part is undrained.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Low strength. The soil is not strong enough to support loads.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Slow 0.06 to 0.2 inch
Moderately slow 0.2 to 0.6 inch
Moderate 0.6 inch to 2.0 inches
Moderately rapid 2.0 to 6.0 inches
Rapid 6.0 to 20 inches

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid or alkaline. The degree of acidity or alkalinity is expressed as

pH
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

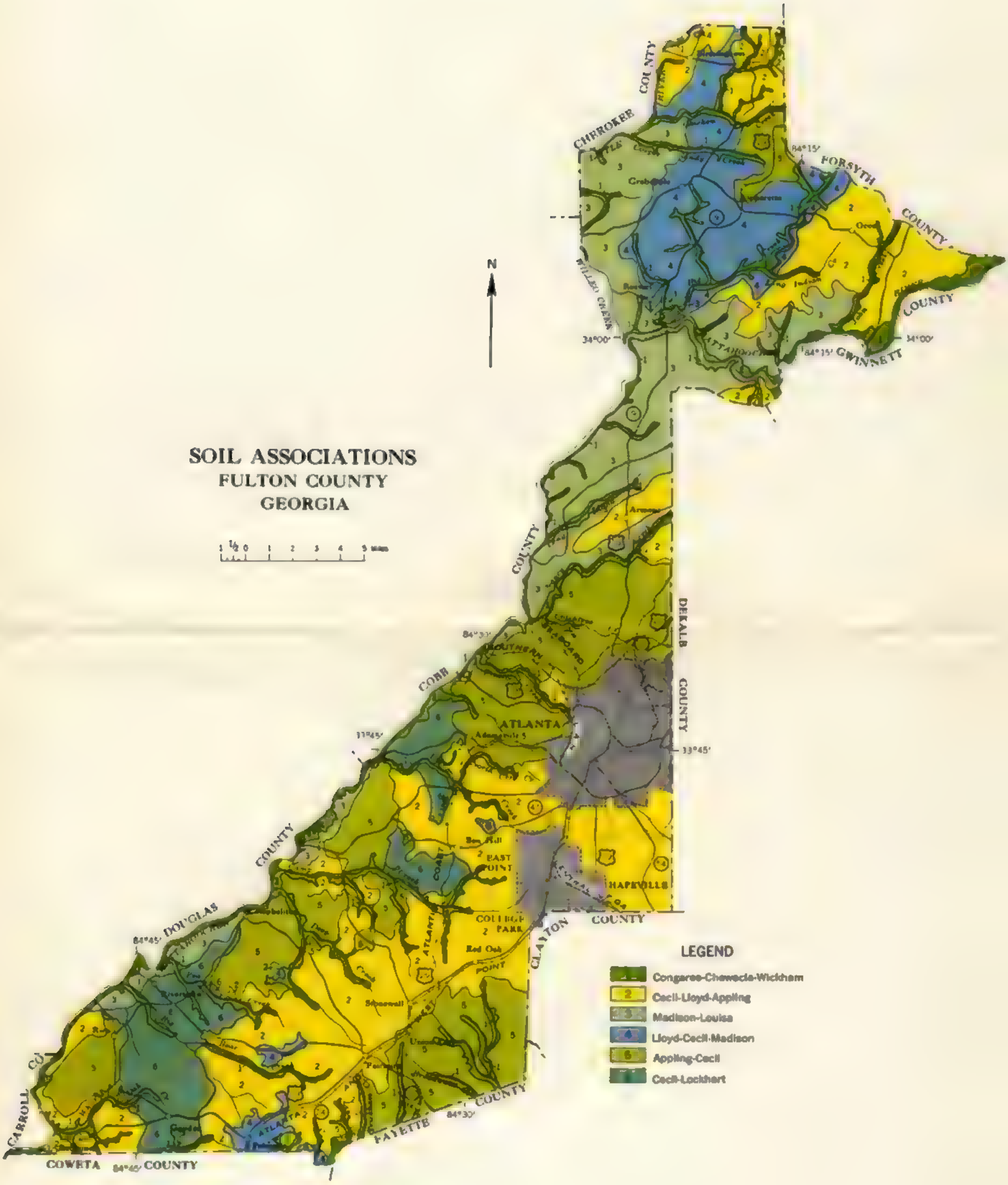
Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

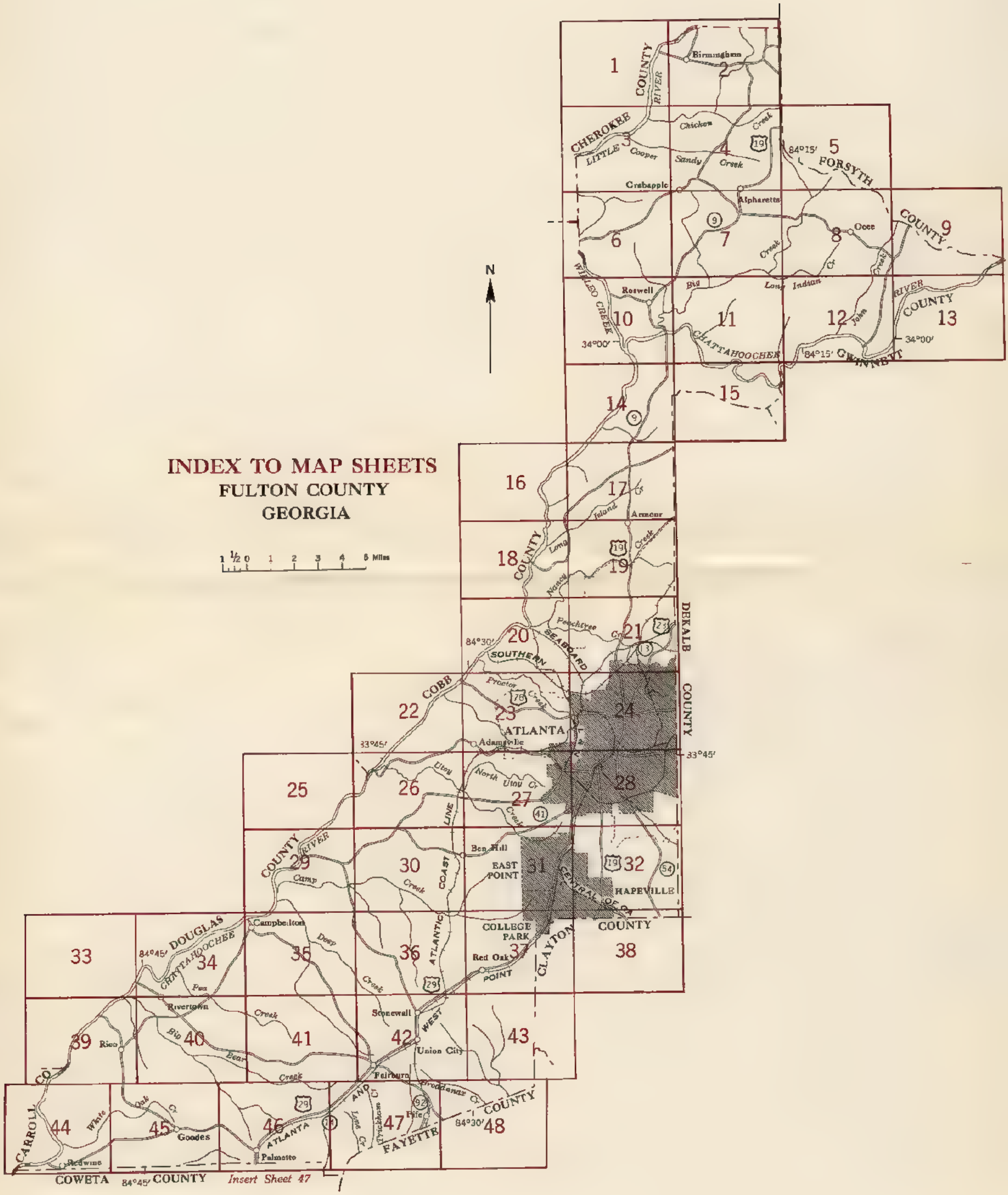
Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Top soil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

SOIL ASSOCIATIONS
FULTON COUNTY
GEORGIA



INDEX TO MAP SHEETS
FULTON COUNTY
GEORGIA



SOIL LEGEND

SYMBOL	NAME
Aa	Altavista fine sandy loam, level phase
Ab	Altavista fine sandy loam, undulating phase
Ar	Altavista fine sandy loam, eroded rolling phase
Ad	Appling sandy clay loam, severely eroded rolling phase
Ae	Appling sandy clay loam, severely eroded hilly phase
Af	Appling sandy loam, undulating phase
Ag	Appling sandy loam, eroded undulating phase
Ah	Appling sandy loam, rolling phase
Ak	Appling sandy loam, eroded rolling phase
Al	Appling sandy loam, hilly phase
Am	Appling sandy loam, eroded hilly phase
An	Appling sandy loam, steep phase
Ao	Augusta fine sandy loam
Ba	Bibb complex, ponded, fine sand
Ca	Cecil clay loam, severely eroded rolling phase
Cb	Cecil clay loam, severely eroded hilly phase
Cc	Cecil clay loam, severely eroded steep phase
Cd	Cecil sandy loam, undulating phase
Ce	Cecil sandy loam, eroded undulating phase
Cf	Cecil sandy loam, rolling phase
Cg	Cecil sandy loam, eroded rolling phase
Ch	Cecil sandy loam, hilly phase
Ck	Cecil sandy loam, eroded hilly phase
Cl	Cecil sandy loam, steep phase
Cm	Cecil sandy loam, ponded, steep phase
Cn	Chewacla fine sandy loam
Co	Chewacla silt loam
Cp	Congaree fine sandy loam
Cr	Congaree silt loam
Da	Davidson clay loam, eroded undulating phase
Db	Davidson clay loam, eroded rolling phase
Dc	Davidson clay loam, eroded hilly phase
Ga	Grover fine sandy loam, eroded undulating phase
Gb	Grover fine sandy loam, eroded hilly phase
Gc	Gullied land
Ha	Helena sandy loam, eroded rolling phase
Hb	Hiwassee sandy loam, eroded undulating phase
Hc	Hiwassee sandy loam, eroded rolling phase
Hd	Hiwassee loam, eroded hilly phase
Ir	Iredell stony clay loam, rolling phase
La	Lloyd clay loam, severely eroded rolling phase
Lb	Lloyd clay loam, severely eroded hilly phase
Lc	Lloyd clay loam, eroded steep phase
Ld	Lloyd gravelly sandy loam, eroded steep shallow phase
Le	Lloyd sandy loam, eroded undulating phase
Lf	Lloyd sandy loam, rolling phase
Lg	Lloyd sandy loam, eroded rolling phase
Lh	Lloyd sandy loam, hilly phase
Lk	Lloyd sandy loam, eroded hilly phase
Lm	Lloyd sandy loam, steep phase
Ln	Lockhart Cecil clay loams, severely eroded rolling phase
Lo	Lockhart Cecil clay loams, severely eroded hilly phases
Lp	Lockhart Cecil clay loams, severely eroded steep phases
Lr	Lockhart Cecil sandy loams, eroded undulating phase
Ls	Lockhart Cecil sandy loams, eroded rolling phases
Lt	Lockhart Cecil sandy loams, hilly phase
Lu	Lockhart Cecil sandy loams, eroded hilly phases
Lv	Lockhart Cecil sandy loams, steep phases
Lw	Lockhart Cecil sandy loams, eroded steep phase
Lx	Louisa fine sandy loam, rolling phase
Lxa	Louisa fine sandy clay loam, eroded phase
Lxh	Louisa fine sandy loam, steep phase
Lxc	Louisa fine sandy loam, eroded steep phase
Ly	Lloyd Shelby sandy loam, rolling phase
Lya	Lloyd Shelby sandy loam, hilly phase
Lyb	Lloyd Shelby sandy loam, steep phase

SYMBOL	NAME
Ma	Made land
Mb	Madison fine sandy loam, severely eroded rolling phase
Mc	Madison fine sandy clay loam, severely eroded hilly phase
Md	Madison fine sandy loam, eroded undulating phase
Me	Madison fine sandy loam, rolling phase
Mf	Madison fine sandy loam, eroded rolling phase
Mg	Madison fine sandy loam, hilly phase
Mh	Madison fine sandy loam, eroded hilly phase
Mk	Madison fine sandy loam, steep phase
Ml	Madison gravelly sandy loam, rolling phase
Mm	Madison gravelly sandy loam, eroded rolling phase
Mn	Madison-Grover-Louisa gravelly clay loam, severely eroded hilly phase,
Mo	Madison-Grover-Louisa gravelly sandy clay loam, hilly phases
Mp	Madison-Grover-Louisa gravelly sandy loam, eroded hilly phases
Mr	Madison-Grover-Louisa gravelly sandy loams, steep phase
Ms	Meckenburg gravelly clay loam, eroded hilly phase
Mt	Meckenburg gravelly sand, loam, eroded rolling phase
Mu	Mixed alluvium, well drained
Mv	Mixed alluvium, somewhat poorly drained
Mw	Mixed alluvium, poorly drained
Mx	Molena loamy sand, lightcolored vers
My	Molena loamy sand, undulating phase
Ra	Riverwash
Sa	Seneca fine sandy loam, level phase
Sb	Seneca fine sandy loam, undulating phase
Sc	Starr loam, level phase
Sd	Starr complex, undulating phase
Se	Stony land, rolling
St	Stony land, hilly
Sg	Stony land, steep
Ua	Unclassified, hilly land
Wa	Wehadkee fine sandy loam
Wb	Wehadkee silt loam
Wc	Wickham fine sandy loam, undulating phase
Wd	Wickham fine sandy loam, eroded undulating phase
We	Worsham sandy loam, undulating phase
Wf	Worsham sandy loam, eroded undulating phase
Wg	Worsham sandy loam, eroded rolling phase

Soils surveyed 1937-49 by J. H. Walker, University of Georgia College of Agriculture, in Charge and T. M. Miller, T. W. Green and R. D. Weis, U. S. Department of Agriculture
Correlation by A. L. Hasty, U. S. Department of Agriculture

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Roads
- Good motor
- Poor motor
- Trail
- Marker, U. S. (33)

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail foot
- Railroad
- Ferry
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church
- Station

Mine and Quarry
- Shaft
- Dump
- Prospect

Pits, gravel or other

Power line

Pipe line

Cemetery

Dam

Levee

Tank

Oil well

Windmill

Canal lock (point upstream)

BOUNDARIES

- National or state
- County
- Township, civil
- U. S.
- Section
- City (corporate)
- Reservation
- Land grant

DRAINAGE

Streams
- Perennial
- Intermittent, unclassified
- Crossable with tillage implements
- Not crossable with tillage implements

Canals and ditches (CANAL / DITCH)

Lakes and ponds
- Perennial
- Intermittent

Wells (flowing)

Springs

Marsh

Wet spot

RELIEF

Escarpments
- Bedrock
- Other

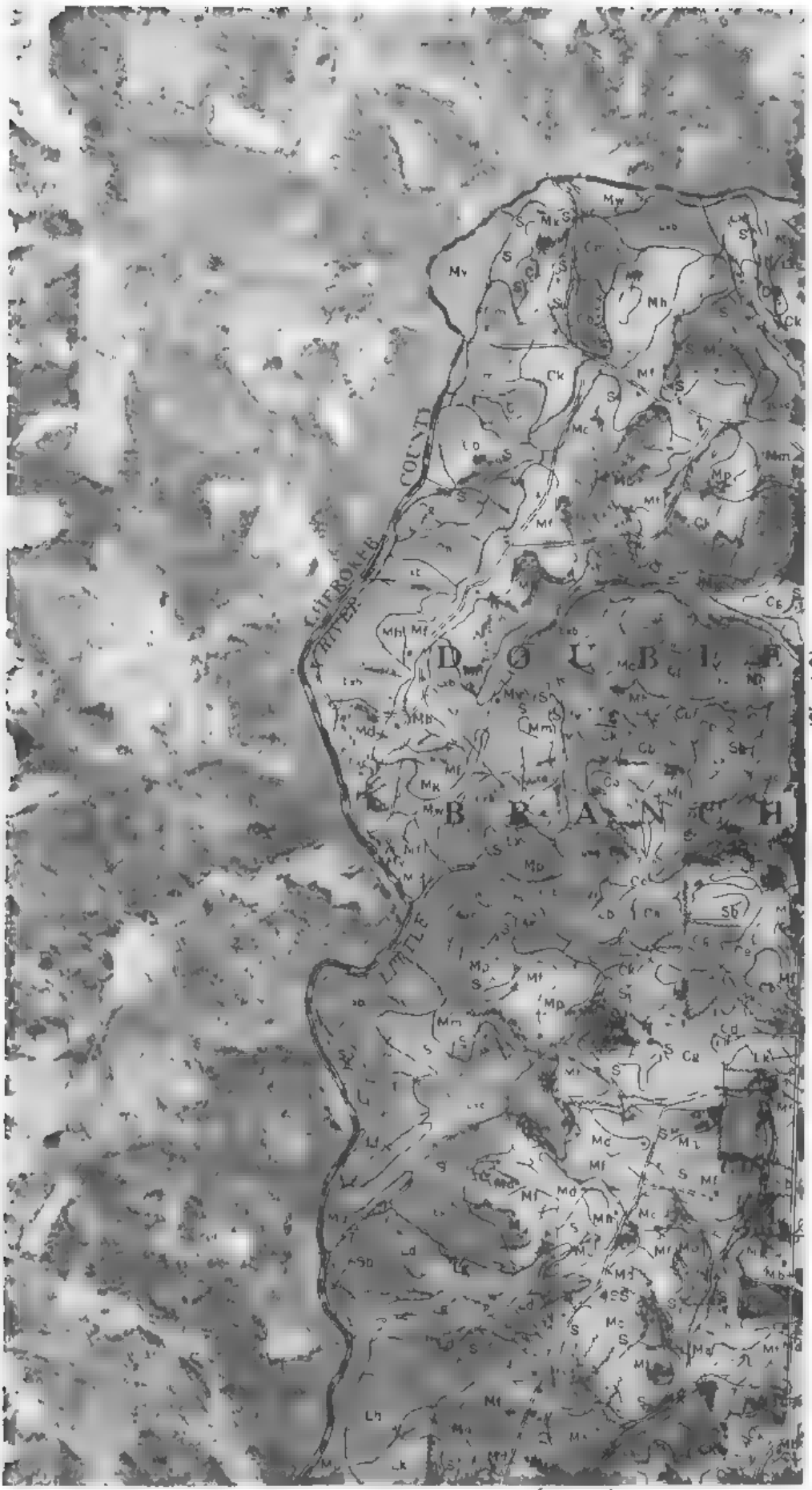
Prominent peaks

Depressions (Large / Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil type outline and symbol (Dx)
- Gravel
- Stones
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Erosion
  - Uneroded spot (J)
  - Sheet, moderate (S)
  - Sheet, severe (SS)
  - Gully, moderate (G)
  - Gully, severe (GG)
  - Sheet and gully, moderate (SG)
  - Wind, moderate
  - Wind, severe
  - Blowout
  - Wind hummock
  - Overblown soil
- Gullies
  - Crossable with tillage implements
  - Not crossable with tillage implements
- Areas of alkali and salts
  - Strong (A)
  - Moderate (M)
  - Slight (S)
- Free of toxic effect (F)
- Sample location (● 26)
- Saline spot

Soil map constructed by Cartographic Division, Soil Conservation Service, USDA, 1957, from 1949-50 aerial photographs.
Controlled mosaic based on polyconic projection, 1927 North American datum


N
5000 Feet
0
1 Mile
½
0
CHEROKEE COUNTY
CHEROKEE RIVER
LITTLE
D O U B L E
B R A N C H
(Sheet 2)
(Sheet 3)

(2)

N

CHEROKEE COUNTY

Birmingham

Hopewell

FORSYTH COUNTY

(Sheet 4)

FULTON COUNTY, GEORGIA

(Sheet 1)

3

N

5000 Feet

0

(Sheet 4)

D O U B L E

B R A N C H

L I T T L E R I V E R

CHEROKEE COUNTY

Arnold

Church

1 Mile

1/2

0

(Sheet 6)

(Sheet 2)

FULTON COUNTY, GEORGIA

N

0

½

1 Mile

(Sheet 3)

DOUBLE BRANCH

ALPHARETTA

LITTLE RIVER

Bethany Church

Bethany

Fields Crossroads

Sandy Creek

FORSYTH COUNTY

(Sheet 5)

(Sheet 7)

FULTON COUNTY, GEORGIA

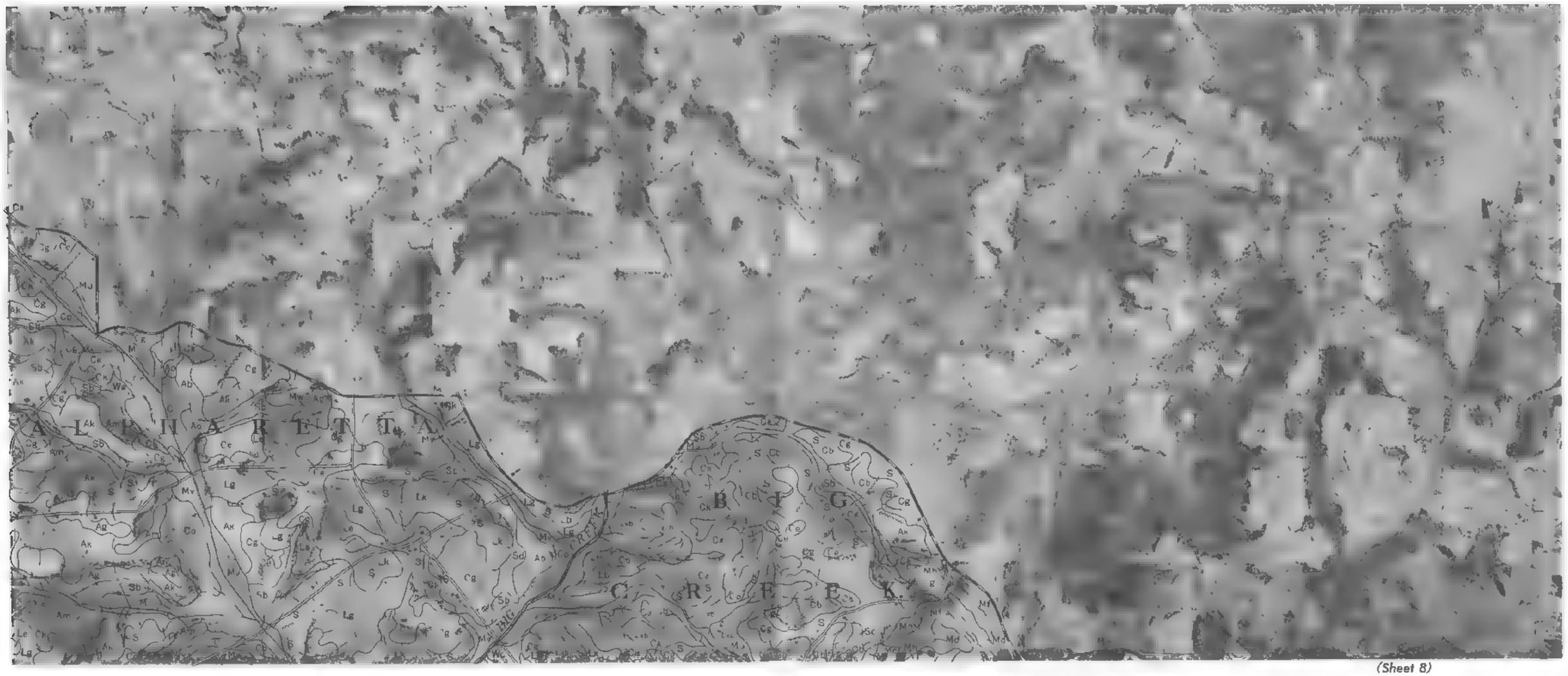
5

N

5000 Feet

0

(Sheet 4)



(Sheet 8)

1 Mile

½

0

(Sheet 3)

FULTON COUNTY, GEORGIA

N

0

½

1 Mile

0

5000 Feet

CHEROKEE COUNTY

COBB COUNTY

Mountain Park Lake

Mountain Park

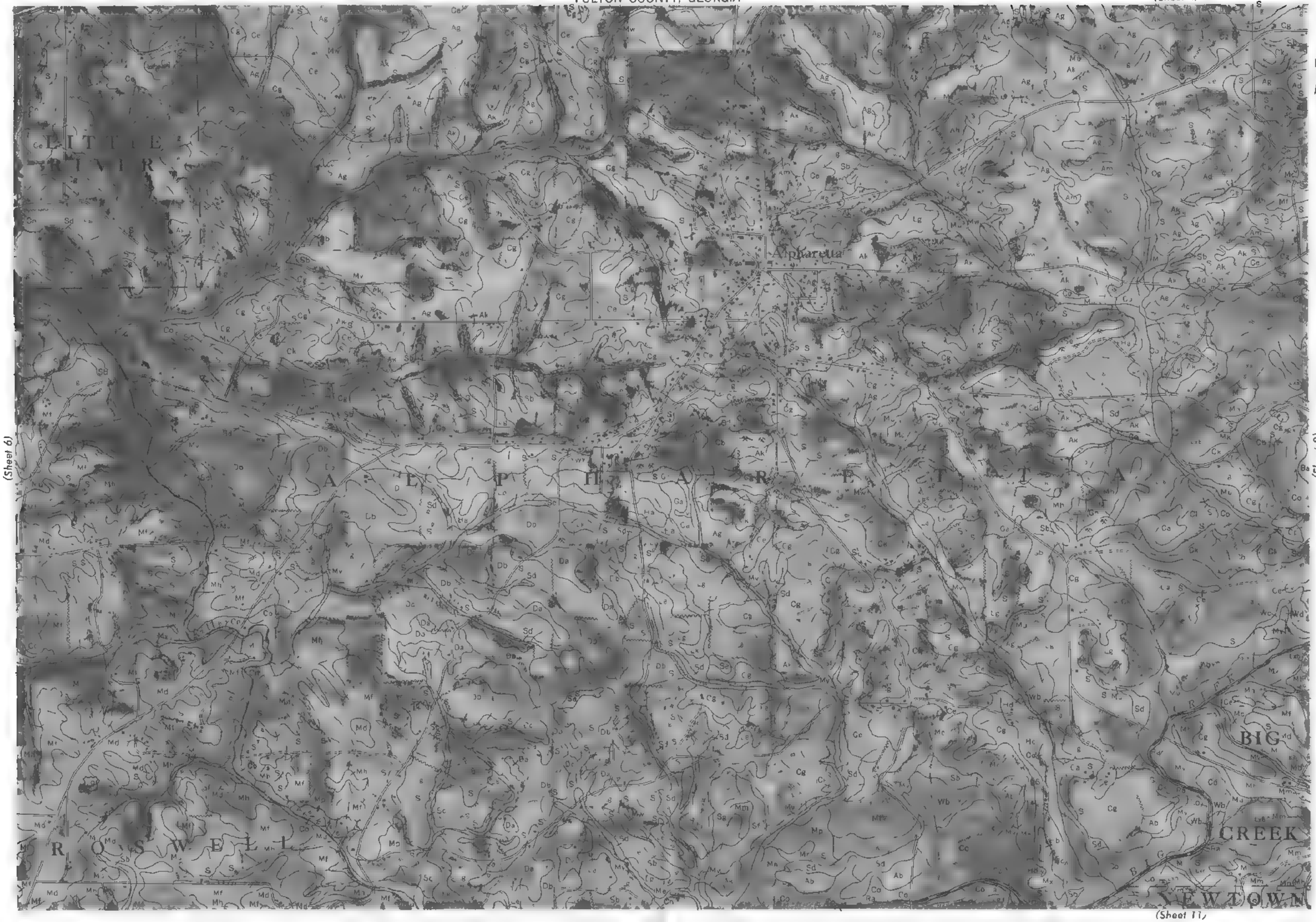
L I T T L E R I V E R

R O S W E L L

Mt Oliver Church

(Sheet 7)

(Sheet 10)


LITTLE
RIVER
Alpharetta
ALPHARETTA
ROSWELL
BIG
CREEK
NEWTOWN
(Sheet 6)
(Sheet 8)
(Sheet 11)
N
5000 Feet
0
1 Mile
½
0

FULTON COUNTY, GEORGIA

(Sheet 5)

N

ALPHARETTA

0 ½ 1 Mile

(Sheet 7)

BIG CREEK

Big Creek Church

CLEAR CREEK

Clear Stream Church

OLD DISTRICT

(Sheet 9)

(Sheet 12)

0 5000 Feet

N

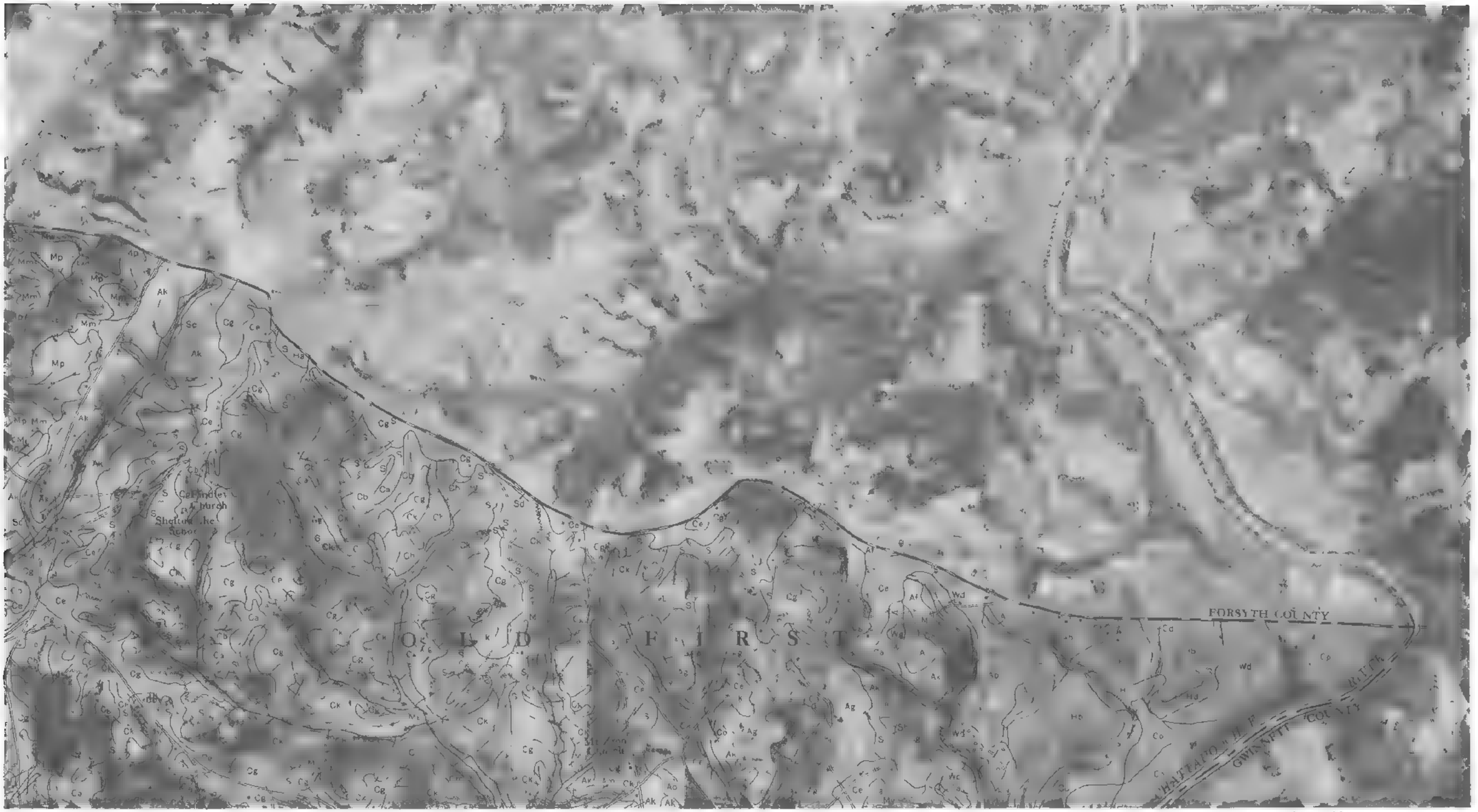
5000 Feet

0

1Mile

½

0



(Sheet 13)

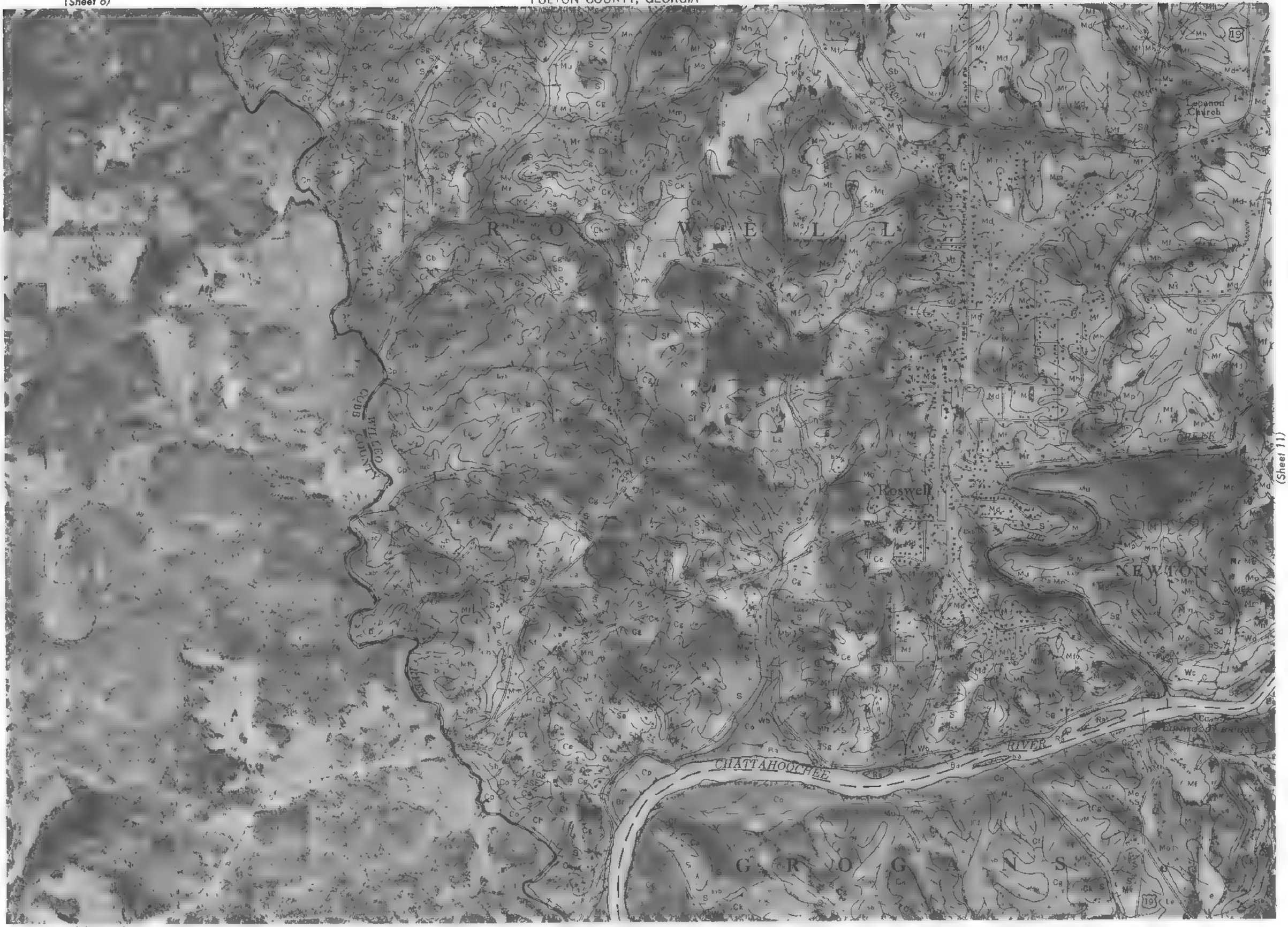
(Sheet 6)

FULTON COUNTY, GEORGIA

N

0 ½ 1 Mile

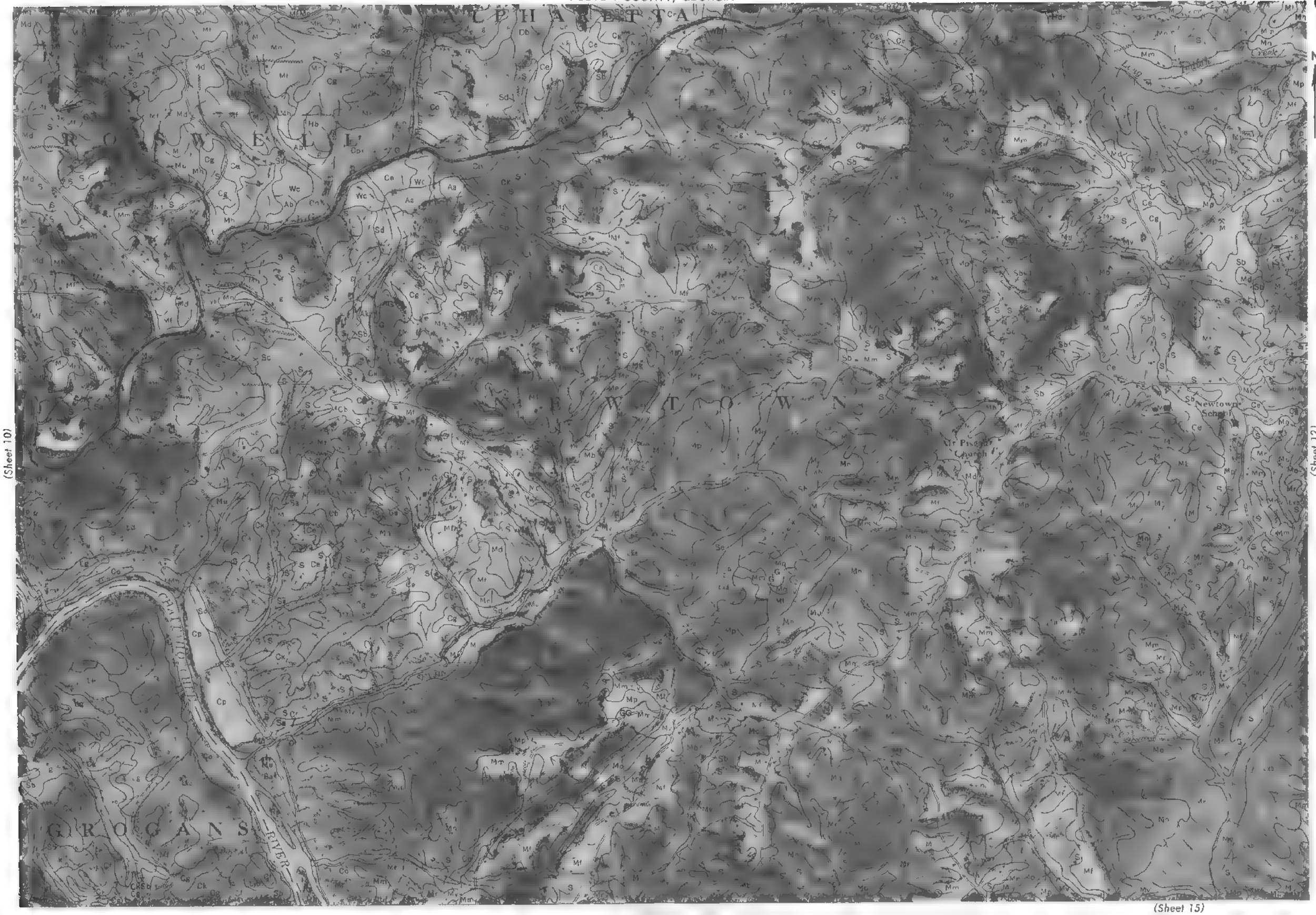
0 5000 Feet



(Sheet 11)

(Sheet 14)

(Sheet 7)



(Sheet 10)

(Sheet 12)

(Sheet 15)

(Sheet 8)

FULTON COUNTY, GEORGIA

BIG CREEK

NEWTOWN

OLD FIRST

Warsaw

RIVER

GWINNETT COUNTY

CHATTAHOOCHEE

N

0

½

1 Mile

0

5,000 Feet

(Sheet 11)

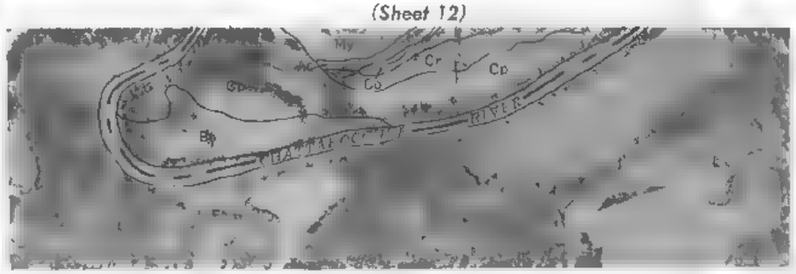
(Inset sheet 15)

(Inset sheet 13)

(Sheet 13)

(Sheet 9)

(Sheet 12)



(Sheet 12)

N

5000 Feet

0

1 Mile

½

0

(Sheet 10)

FULTON COUNTY, GEORGIA

N

0

½

1 Mile

0

5000 Feet

COBB COUNTY

CHATTAHOOCHEE RIVER

Mayson Forest

G R O G A N S

O A K S

G R O V E

DEKALB COUNTY

(Sheet 15)

(Sheet 17)

(Sheet 11)

15

(inset below left)

(Sheet 14)

(Sheet 12)

(Sheet 15)

N

5000 Feet

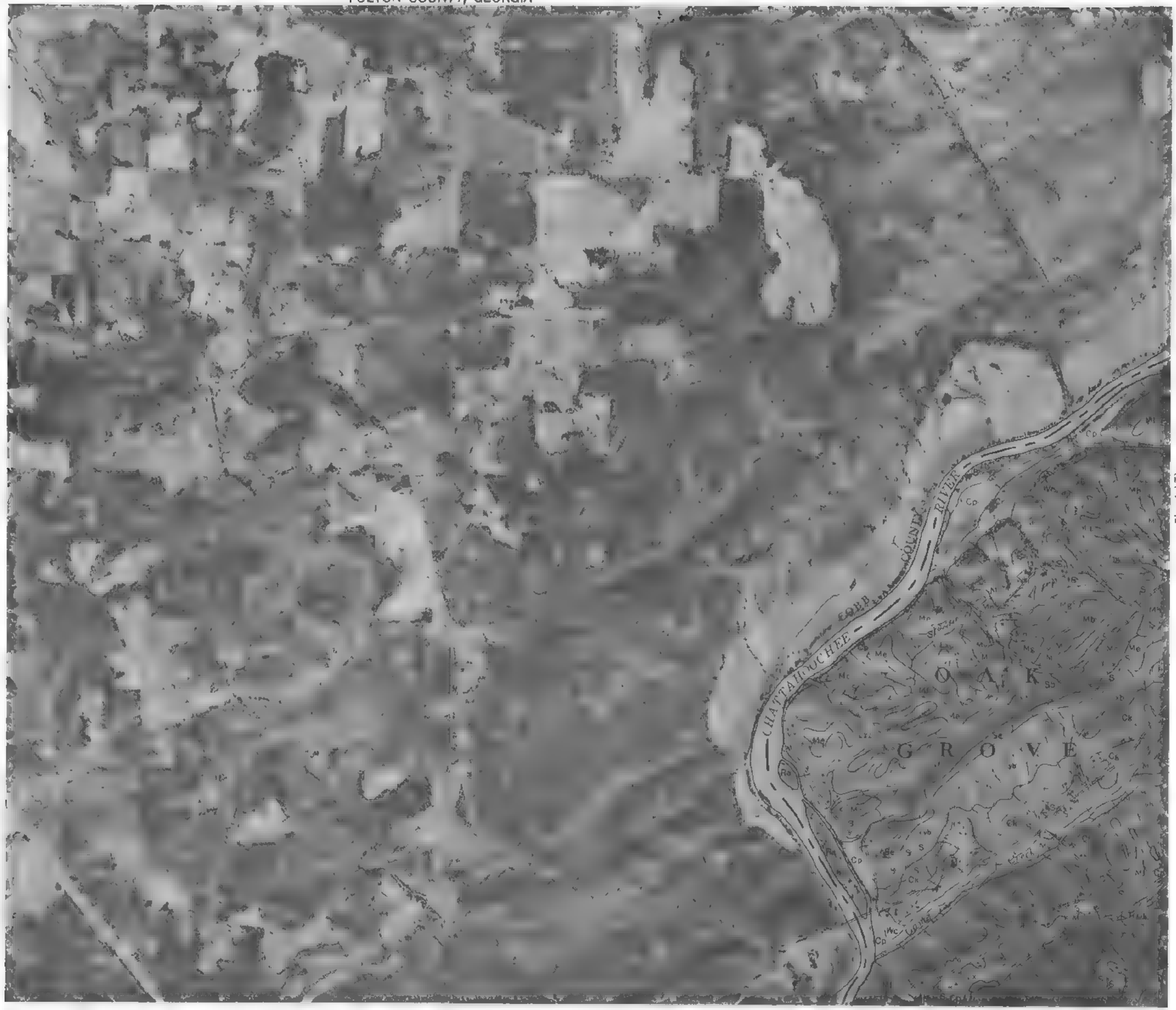
0

1 Mile

½

0

FULTON COUNTY, GEORGIA



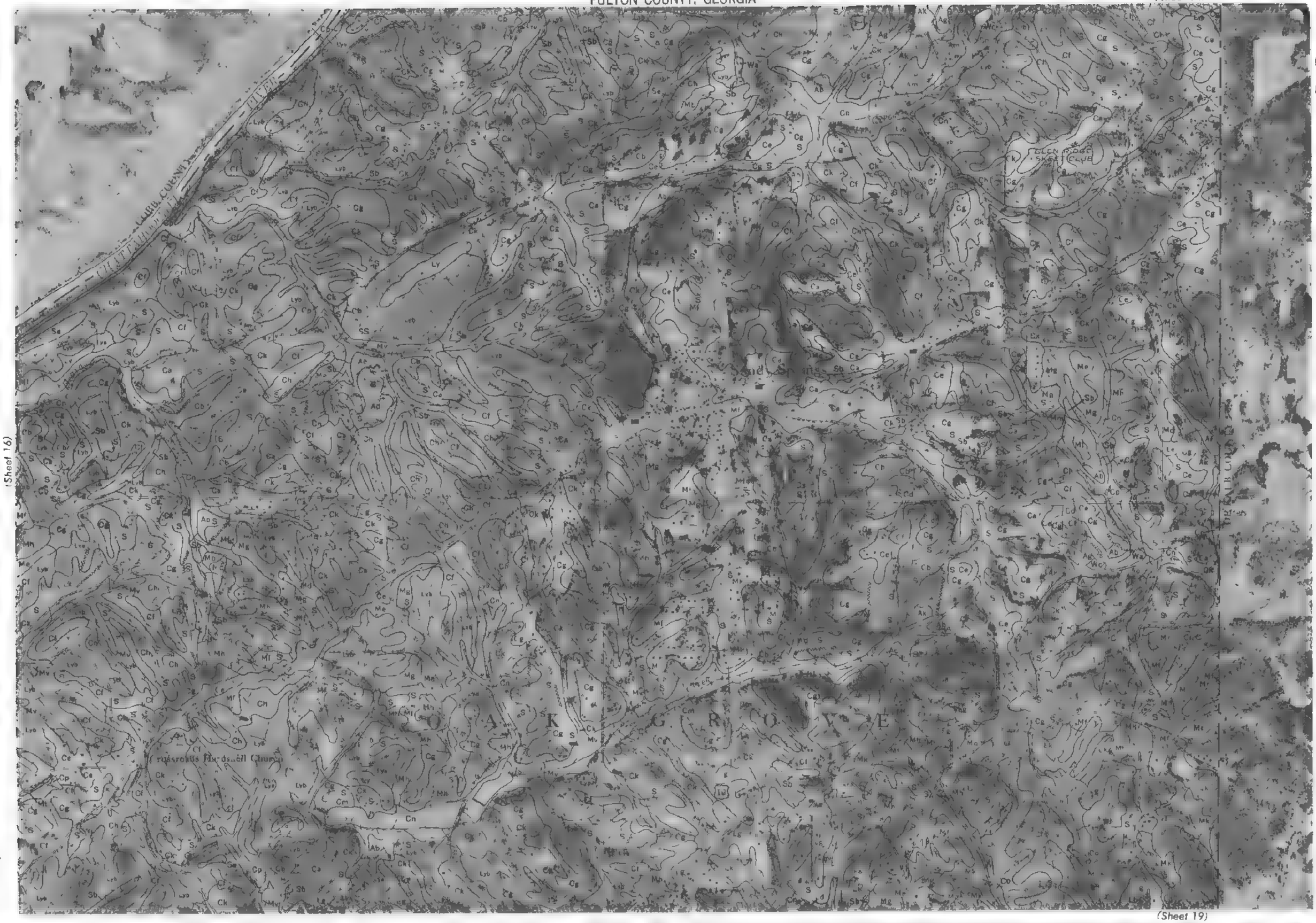
(Sheet 17)

(Sheet 18)

N

0 ½ 1 Mile

0 5000 Feet

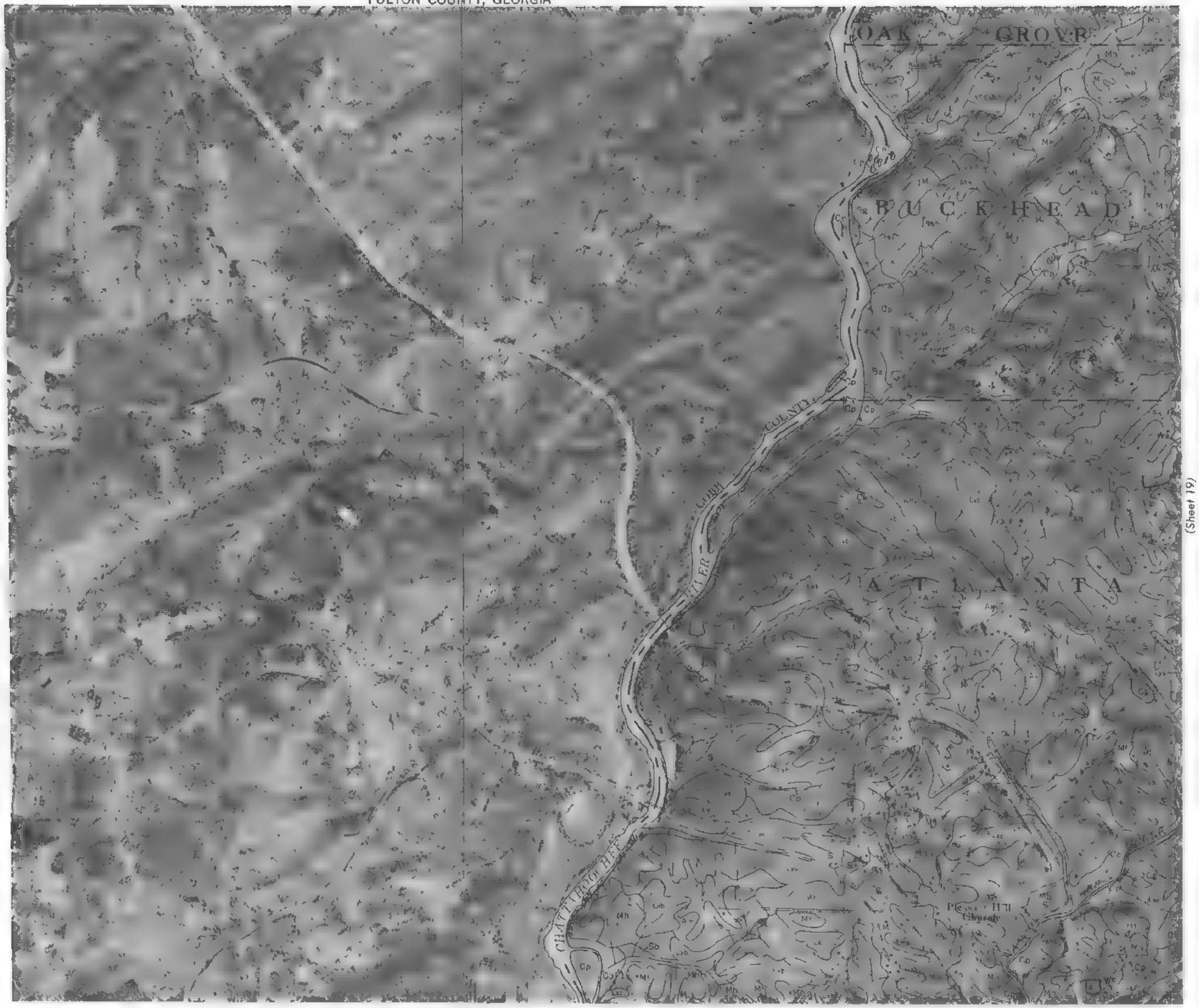


(Sheet 16)

(Sheet 19)

(Sheet 16)

FULTON COUNTY, GEORGIA



N

0 1/2 1 Mile

0 5000 Feet

(Sheet 19)

(Sheet 20)

(Sheet 18)

OAK GROVE

BLACK HEAD

Chastain Memorial Park

Capitol City Park

(Sheet 21)

N

5,000 Feet

0

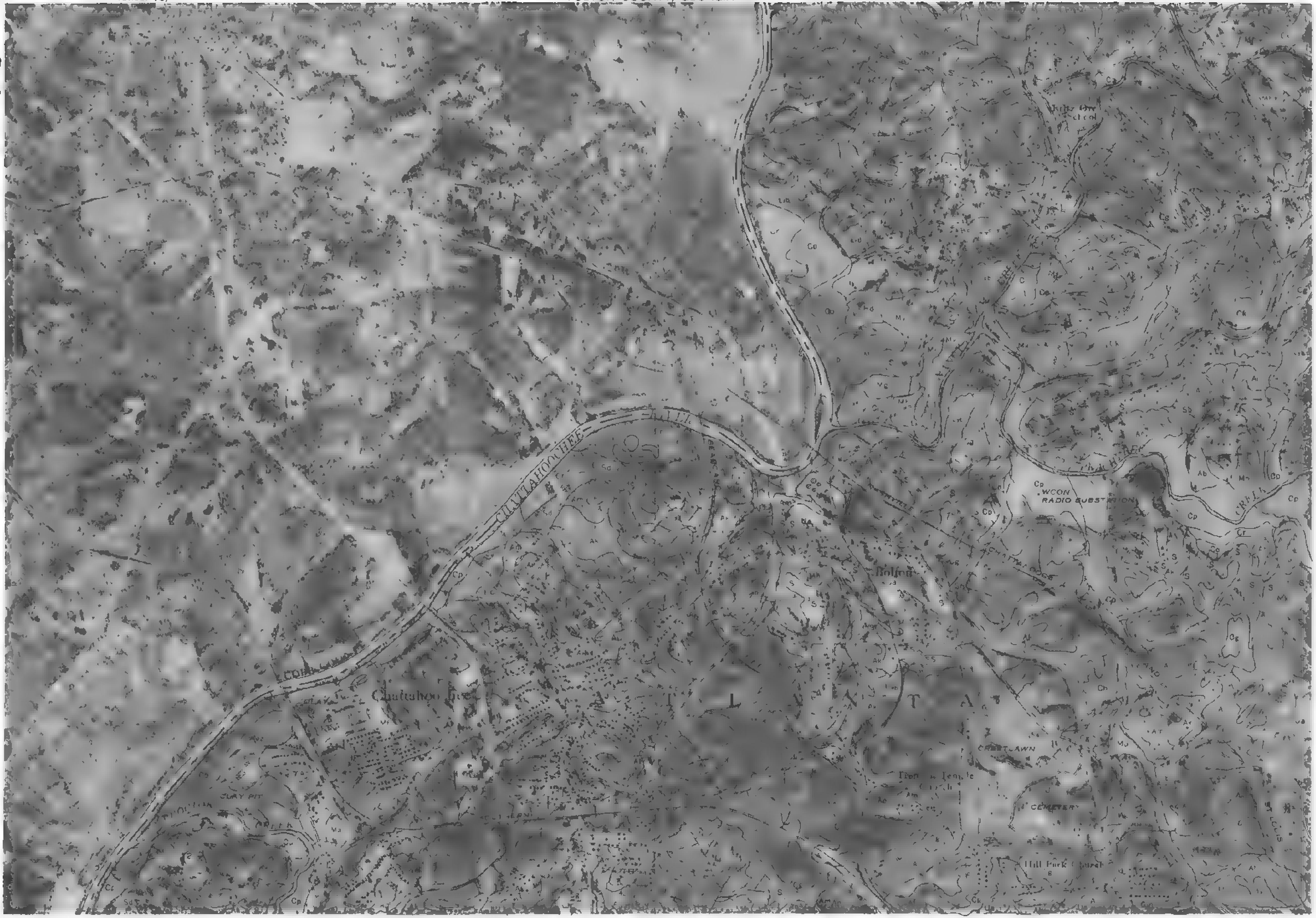
1 Mile

0 ½ 1

N

0
1/2
1 Mile

0
5000 Feet



(Sheet 21)
(Sheet 23)

(Sheet 19)

21

(Sheet 20)

(Sheet 24)

N

5,000 Feet

0

1 Mile

½

0

ATLANTA

New Hope School

Morris Brandon School

PEACHTREE ROAD

PEACHTREE CREEK

SOUTHERN AIR LINE

SEABOARD

SOUTHERN RAILWAY

WEST RADIO SUBSTATION

Mabray Lake

FULTON COUNTY, GEORGIA

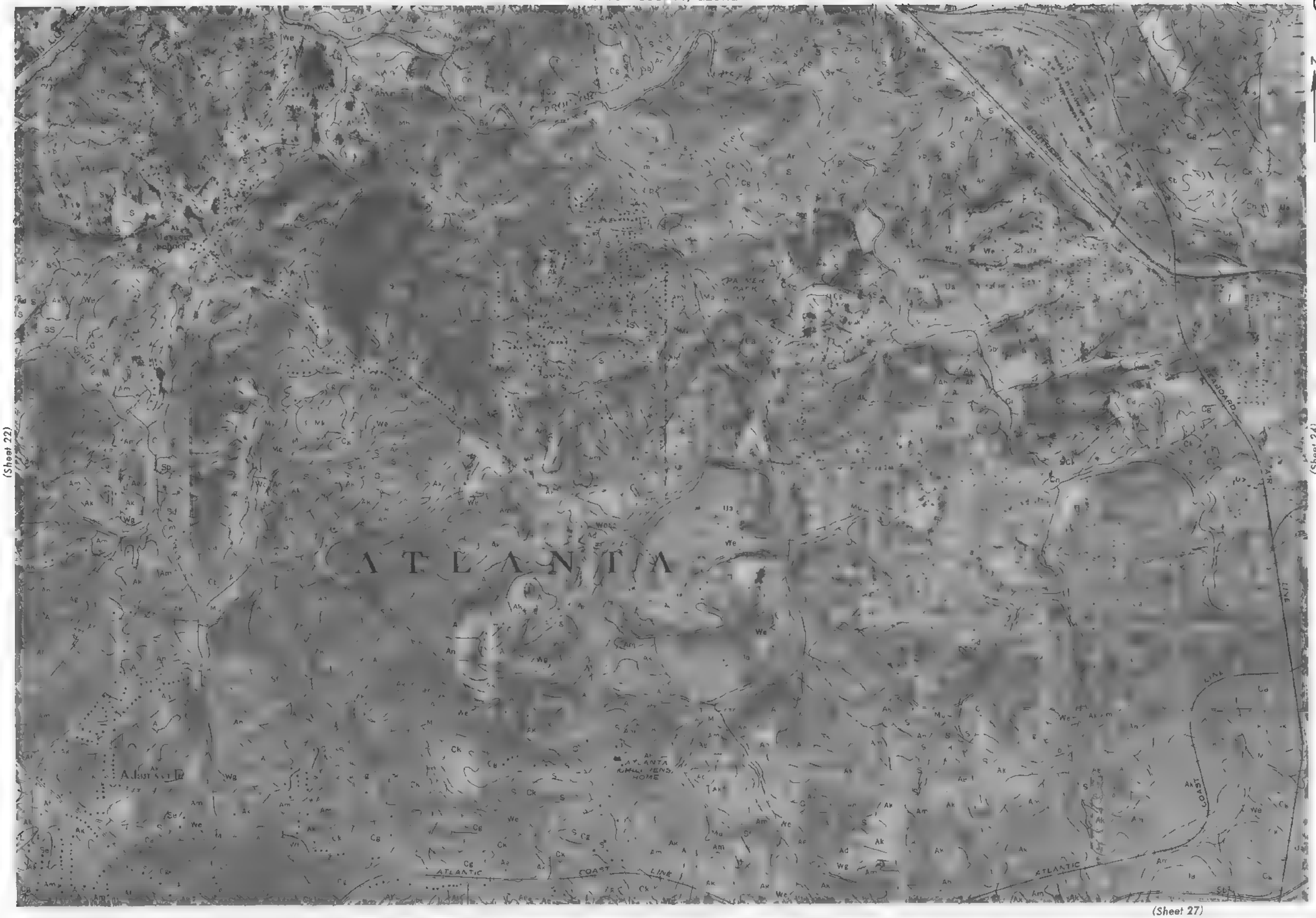
N

0 ½ 1 Mile

0 5000 Feet

(Sheet 23)

(Sheet 26)



(Sheet 22)
(Sheet 24)
(Sheet 27)

(Sheet 21)

FULTON COUNTY, GEORGIA

N

0

½

1 Mile

(Sheet 23)

ATLANTA

SEABOARD AIR LINE

SOUTHERN

CLEAR CREEK

BOULEVARD

DE KALB COUNTY

HIGHLAND

COAST

MARIETTA

STREET

SOUTHERN

PEACHTREE

PIEDMONT

NORTH AVE

SOUTH

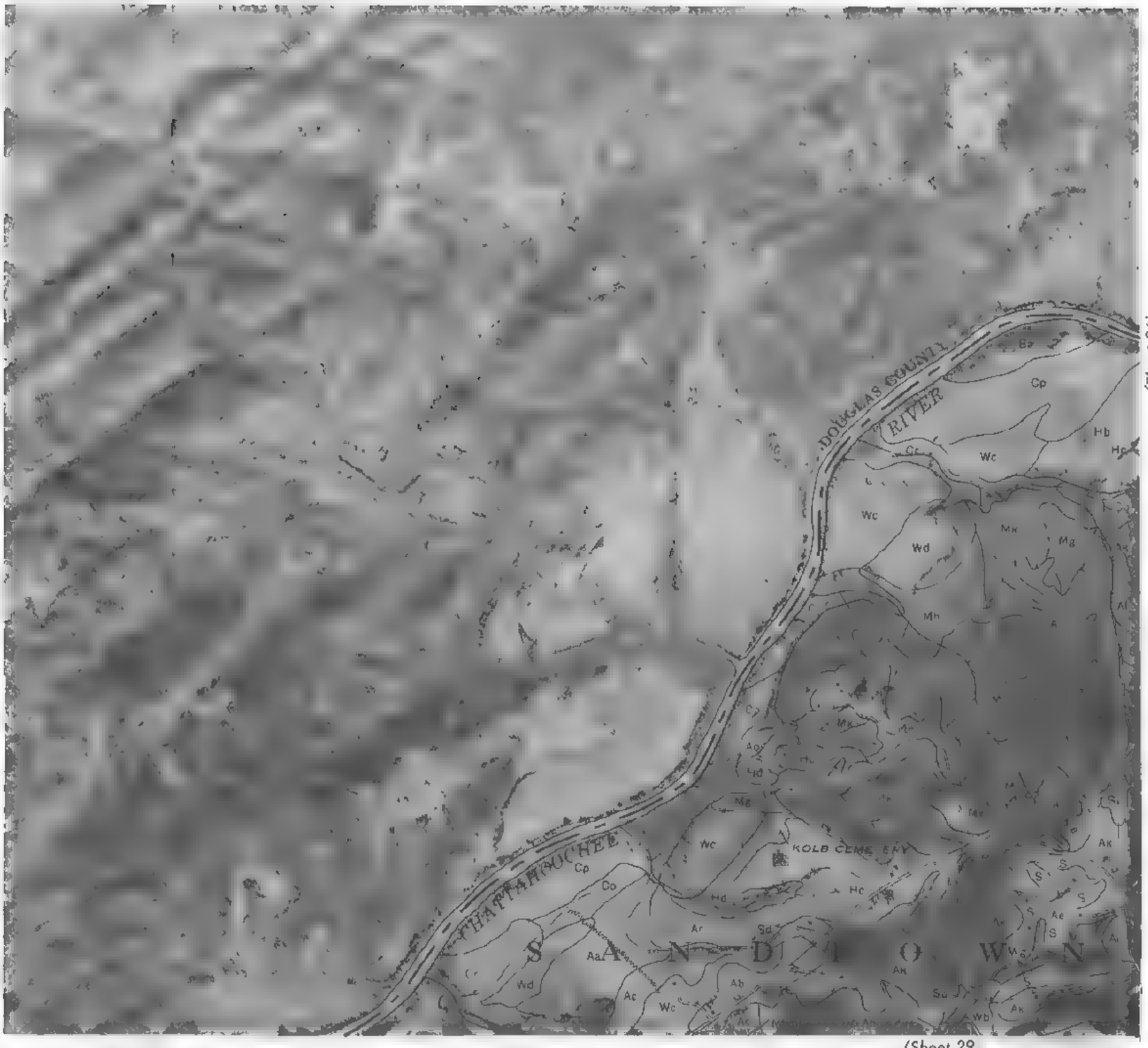
AVE

SEABOARD AIR LINE

0

5000 Fee

(Sheet 28)


N
5000 Feet
0
(Sheet 26)
DOUGLAS COUNTY
CHATTAHOOCHEE RIVER
KOLB CEME ETY
SANDTOWN
1 Mile
½
0
(Sheet 29)

(Sheet 22)

FULTON COUNTY, GEORGIA

ATLANTA

A D A M S V I L L E

CHATTAHOOCHEE RIVER

CUBB COUNTY

DOUGLAS COUNTY

Ken Hope Church

Poplar Springs Sch.

S A N D T O W N

P O E L L

B R Y A N T

VENTO CEMETERY

N

0

½

1 Mile

(Sheet 25)

0

5000 Feet

(Sheet 27)

(Sheet 30)

(Sheet 26)
(Sheet 28)
(Sheet 31)

(Sheet 24)

FULTON COUNTY, GEORGIA

N

0 ½ 1 Mile

A T L A N T A

PETERS STREET

WEST POINT

GEORGIA

SOUTHERN

BOULEVARD

CENTRAL

ATLANTA

AVE

STREET

SEABOARD AIR LINE

SOUTHERN

STEWART

PRYOR

JONESBORO ROAD

SOUTH

CONFEDERATE SOLDIERS HOME

Woodland Hills Church

FEDERAL PRISON

DE KALB COUNTY

0 5000 Feet

(Sheet 27)

(Sheet 32)

(Sheet 25)

SANDTOWN

CAMPBELLTOWN

OLD YINTH

CHATTAHOOCHEE RIVER

FULTON COUNTY

Bear Creek

Bear Church

N

5000 Feet

0

1Mile

½

0

(Sheet 30)

(Sheet 35)

30

(Sheet 26)

N

0

½

1 Mile

(Sheet 29)

0

5000 Feet

SANDTOW

Ben Hill

BRYANTS

NORTH

(Sheet 31)

(Sheet 36)

ATLANTA

BRYAN

DEKALB

EAST POINT

PEVILLE

COLLEGE PARK

Connally Church

Central Church

McGarity Church

CONNALLY CEMETERY

WEST POINT

CENTRAL

GEORGIA

East Point

College Park

N

5000 Feet

0

1 Mile

½

0

(Sheet 30)

(Sheet 32)

(Sheet 37)

(Sheet 28)

FULTON COUNTY, GEORGIA

N

0 ½ 1 Mile

(Sheet 31)

0 5000 Feet

ATLANTA

HAPEVILLE

Hapeville

Cleveland Ave Church

Oak Knob School

South View Cemetery

South View Church

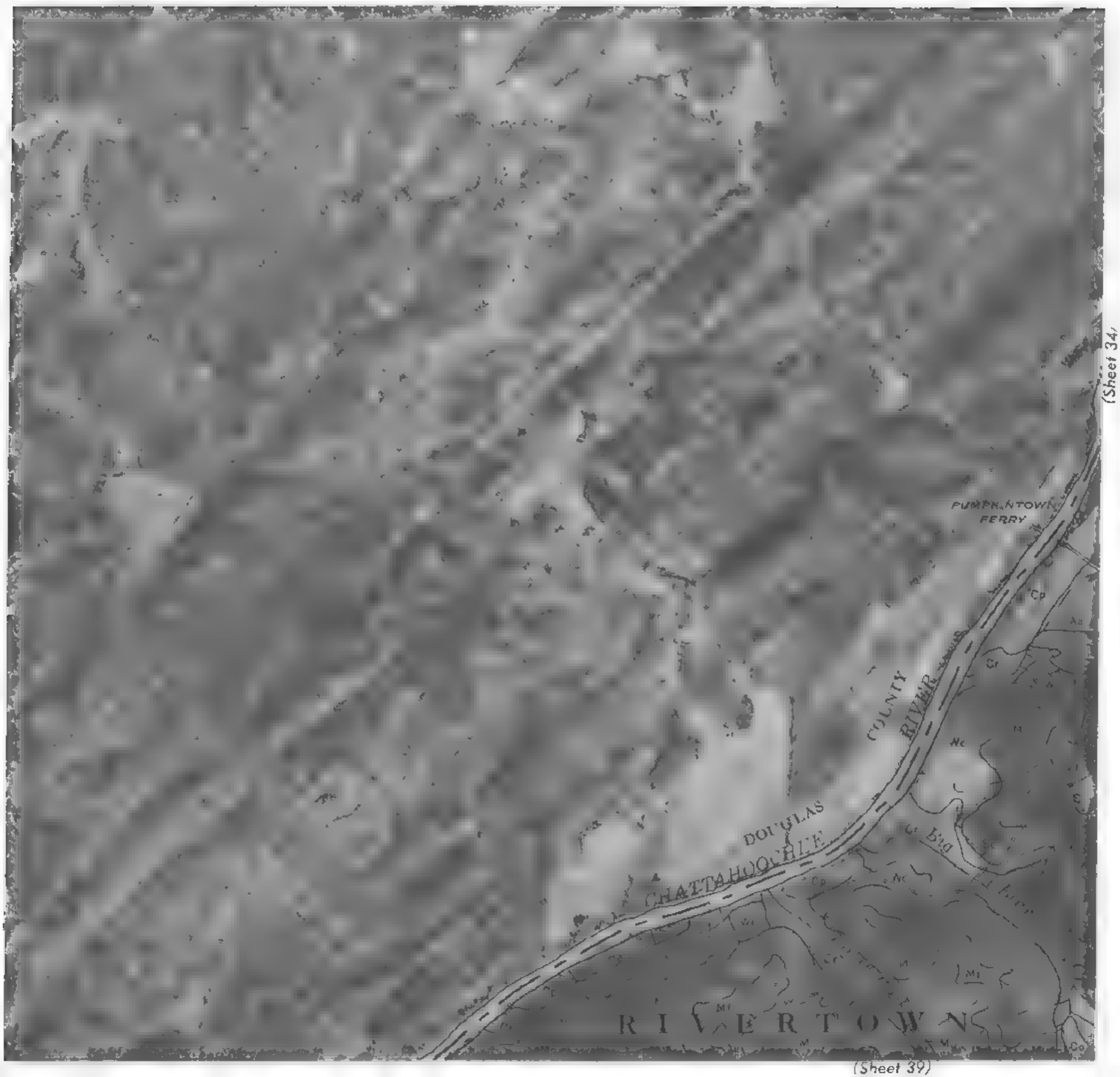
SEWAGE DISPOSAL PLANT

SOUTH RIVER

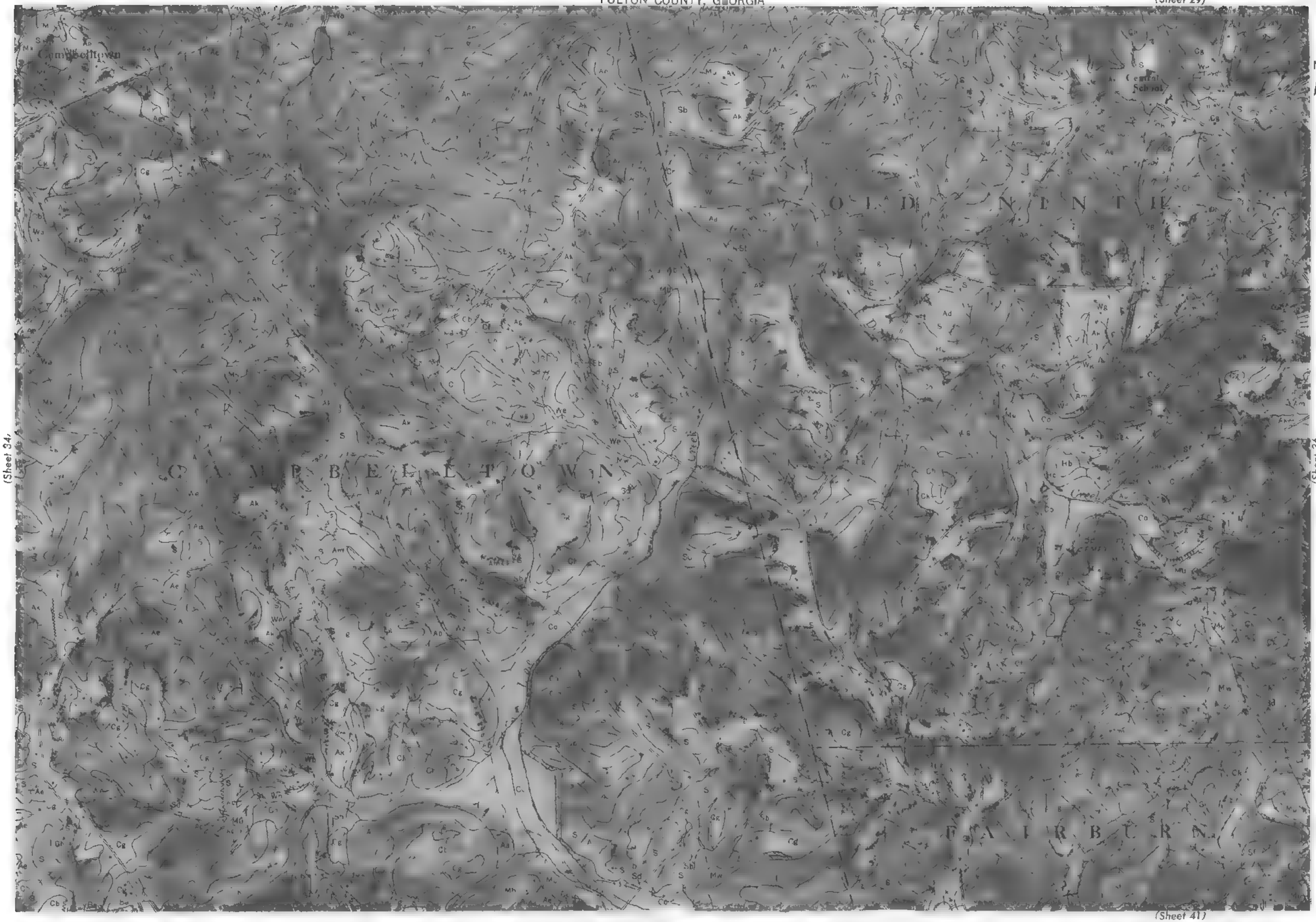
CAMPBELL RIVER

DEKALB COUNTY

(Sheet 38)

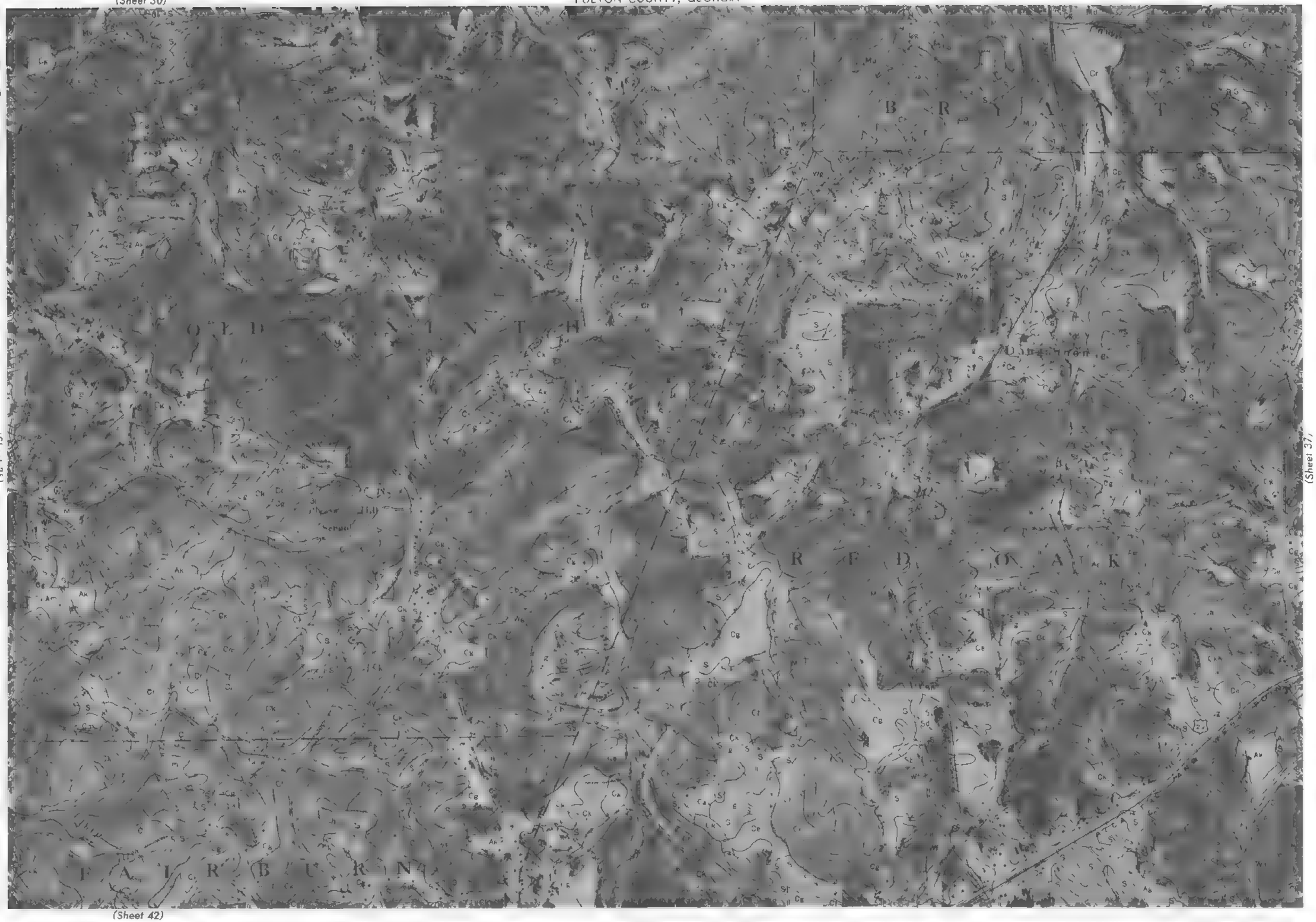

N
5000 Feet
0
(Sheet 34)
PUMPKINTOWN FERRY
COUNTY
RIVER
DOUGLAS
CHATTAHOOCHEE
RIVERTOWN
1 Mile
½
0
(Sheet 39)


N
0
½
1 Mile
0
5000 Feet
CHATTAHOOCHEE
COBB
COUNTY
RIVER
DOUGLAS
Mesca
RIVERTOWN
Rivertown
GAMPBELLTOWN
(Sheet 33)
(Sheet 35)
(Sheet 40)

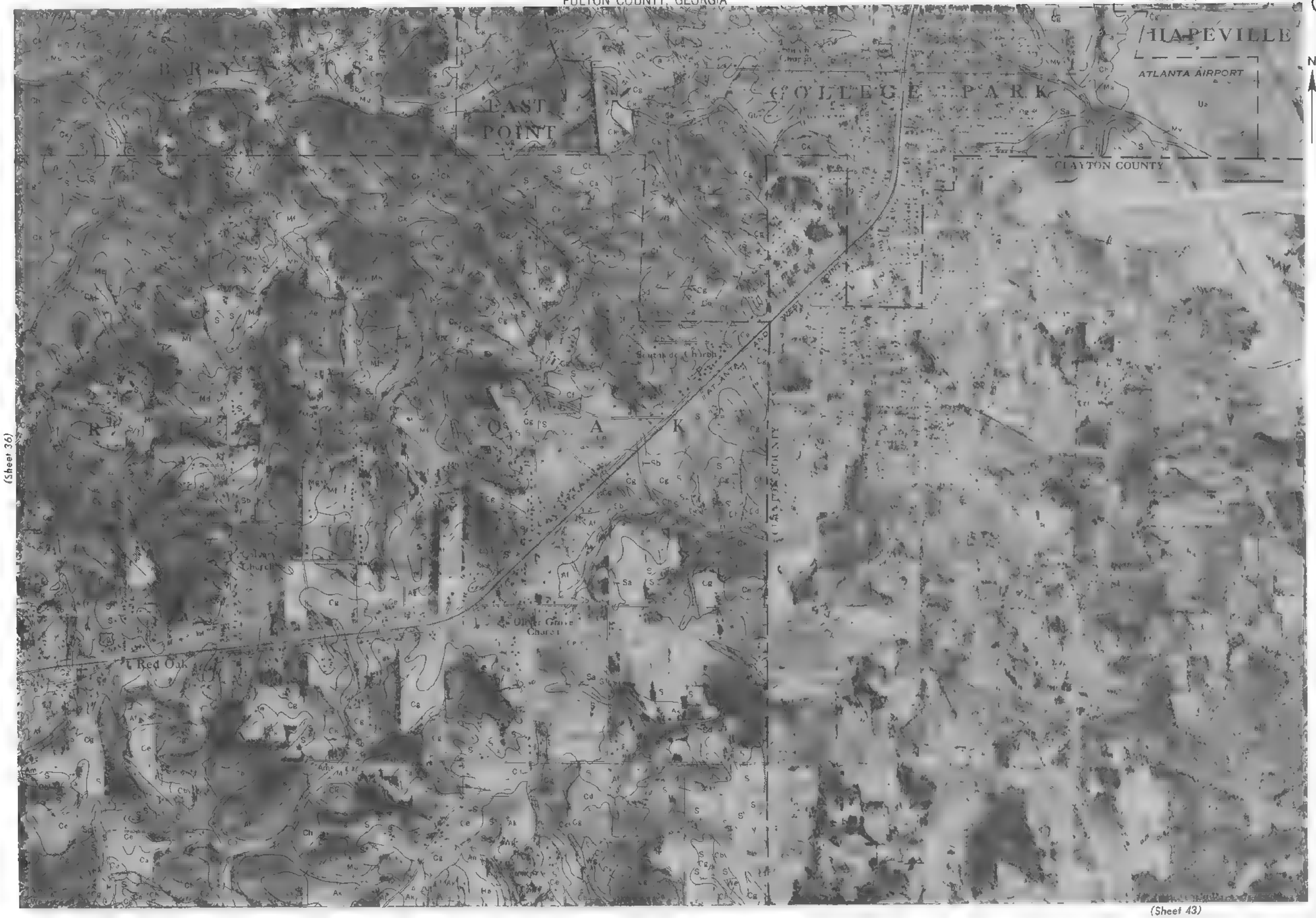

Campbellton
Central School
OLD NINETY
CAMPBELLTOWN
FAIRBURN
Creek
N
5000 feet
0
1 Mile
0
(Sheet 34)
(Sheet 36)
(Sheet 41)

(Sheet 30)

FULTON COUNTY, GEORGIA



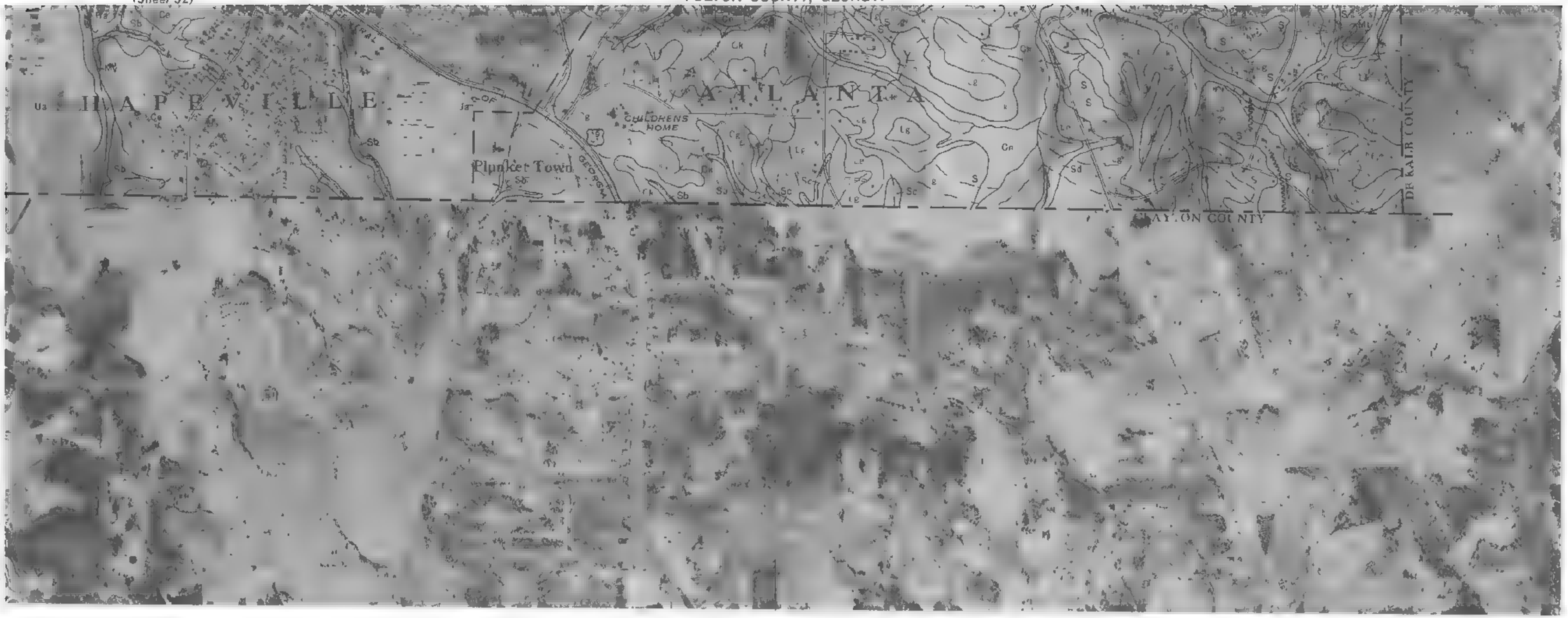
(Sheet 31)



(Sheet 36)

(Sheet 43)

(Sheet 32)


N
0
1/2
1 Mile
(Sheet 37)
0
5000 Feet
CHAPEVILLE
ATLANTA
Plunket Town
CHILDRENS HOME
GEORGIA
RAILROAD
CLAYTON COUNTY
DE KALB COUNTY


DOUGLAS COUNTY
CARROLL COUNTY
R I V E R T O W N
G O O D E S
Rico
N
5000 Feet
0
1 Mile
½
0
(Sheet 40)
(Sheet 44)
(Sheet 45)

(Sheet 34)

FULTON COUNTY, GEORGIA

N

0 1/2 1 Mile

CAMPBELLTOWN

RIVERTOWN

Friendship Church

Bear

PALMETTO

GOODES

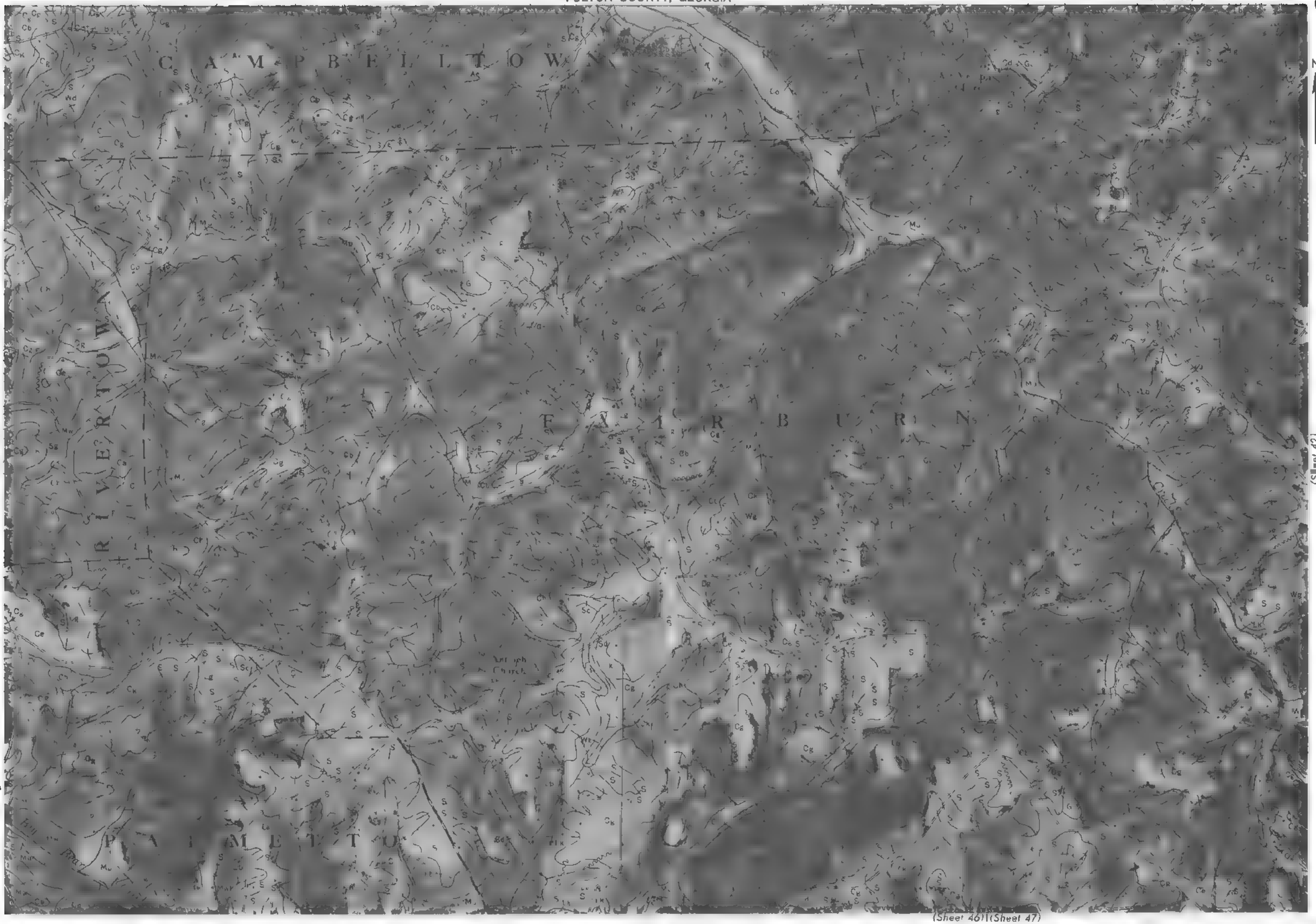
(Sheet 39)

(Sheet 41)

0 5000 Feet

(Sheet 45)

(Sheet 46)



(Sheet 40) (Sheet 42) (Sheet 46) (Sheet 47)

(Sheet 36)

FULTON COUNTY, GEORGIA

(Sheet 43)

N

0 ½ 1 Mile

0 5000 Feet

FAIRBURN

Fairburn

Union City

(Sheet 41)

(Sheet 47) | (Sheet 48)

(Sheet 42)

(Sheet 48)

N

0 5,000 Feet

0 ½ 1 Mile

FULTON COUNTY, GEORGIA

(Sheet 39)

(Sheet 45)

N

0 ½ 1 Mile

0 5000 Feet

CHATTAHOOCHEE

CARROLL COUNTY

RIVER

HUTCHESON FERRY

Redwine

Creek

White

G O O D E S

(Sheet 44)

(Sheet 46)

N

5000 Feet
0

1 Mile
½
0

(Sheet 40) | (Sheet 41)

FULTON COUNTY, GEORGIA

N

0 ½ 1 Mile

0 5000 Feet

(Sheet 45)

(Sheet 47)

(Inset sheet 47)

Palmetto

COWETA COUNTY

WEST POINT

ATLANTA AND

Big Creek

FAIRBURN

PALMETTO

(Sheet 41) | (Sheet 42)

(Sheet 46)

(Sheet 48)

N

5000 Feet

0

1 Mile

½

0

PAULDING COUNTY

DOUGLAS COUNTY

FULTON COUNTY

FAYETTE COUNTY

COWETA COUNTY

ATLANTA & WEST POINT R.R.

SEABOARD AIR LINE R.R.

ATLANTIC C.L.R.R.

Chattahoochee River

Line Creek

Whitewater Creek

PALMETTO

UNION

Fife

(Inset right)

(Sheet 46) | (Sheet 47)

(Sheet 42) | (Sheet 43)

FULTON COUNTY, GEORGIA